

PUBLIC HEALTH REPORTS

In this issue



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service



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CONTENTS

	<i>Page</i>
Health needs of the nation <i>Surgeon General Luther L. Terry</i>	845
Accident prevention and nursing <i>Grace Mattis</i>	853
The public health nurse's expanding responsibilities <i>Zella Bryant</i>	857
Changing concepts concerning cancer <i>Michael B. Shimkin</i>	861
Tuberculosis casefinding, 1961 <i>Edward T. Blomquist</i>	871
Residency training in PHS hospitals <i>Frank S. French</i>	877
Staphylococcal infection in meat animals and meat workers <i>Reimert T. Ravenholt, Robert C. Eelkema, Marie Mulhern, and Ray B. Watkins</i>	879
Oral infectivity and thermal resistance of <i>Nocardia asteroides</i> in milk <i>A. C. Pier and J. B. Enright</i>	889
Respiratory and enteric viruses in man and animals <i>Francis R. Abinanti</i>	897
Community spread of orally administered attenuated polio- virus vaccine strains. Minnesota studies of oral polio- myelitis vaccine <i>Anne C. Kimball, Robert N. Barr, Henry Bauer, Herman Kleinman, Eugene A. Johnson, and Marion K. Cooney</i>	903

Continued▶



frontispiece

A new Public Health Service Indian Hospital, built at the base of a mesa on the Hopi Reservation at Keams Canyon, Ariz., will serve some 5,400 Indians in the Hopi and Navajo tribes (see page 870).

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RAVENHOLT, REIMERT T. (Department of Public Health, Seattle-King County, Wash.), **EELKEMA, ROBERT C., MULHERN, MARIE, and WATKINS, RAY B.:** *Staphylococcal infection in meat animals and meat workers. Public Health Reports, Vol. 76, October 1961, pp. 879-888.*

An outbreak of boils and carbuncles among workers in a poultry-processing plant in 1956 in Seattle, Wash., and the findings of investigations of several outbreaks of food poisoning in the community in recent years suggested that considerable staphylococcal disease may derive from nonhuman reservoirs of infection. To explore this possibility, an investigation of staphylococcal disease of meat animals and meat workers was undertaken in 1960.

Histories of suppurative illness and swab specimens of skin lesions (when present) and nostrils (routinely) were obtained from 318 meat workers in 15 meat-handling establishments in Seattle. These workers reported 124 episodes of "septicemia," an attack rate of 34 per 1,000 worker-years. Many of them stated that pork bone lacerations seemed more likely to become infected than lacerations

from other causes.

Coagulase-positive staphylococci were obtained from the nostrils of 102 (32 percent) of the 318 workers.

A considerable variety of staphylococci were isolated from lesions of meat animals and meat workers. But type 80/81 staphylococcus, which was isolated from lesions of four workers, was not isolated from any of the animal lesions.

From these and other findings reported in the literature, we suggest that type 80/81 staphylococcus is primarily a human pathogen, with unique pathogenic and especially mammopathic qualities, and that its relationship to other staphylococci and man may be somewhat analogous to that of *Salmonella typhi* to other *Salmonella* and man. Conversely, certain other types of staphylococci may primarily parasitize certain animal species and humans only secondarily.

PIER, A. C. (University of California at Davis), and **ENRIGHT, J. B.:** *Oral infectivity and thermal resistance of *Nocardia asteroides* in milk. Public Health Reports, Vol. 76, October 1961, pp. 889-895.*

Because of an increase in reported cases of nocardial mastitis in dairy cattle, the oral infectivity of milkborne *Nocardia asteroides* and the susceptibility of the organism to pasteurization were investigated.

No infection was caused by oral transmission of infectious milk to normal

calves, guinea pigs, and swine. Lung lesions developed only in those animals in which aspiration was induced.

Simulated pasteurization experiments revealed that the organism is effectively destroyed at temperatures below those recommended for pasteurization of commercial milk.

KIMBALL, ANNE C. (Minnesota Department of Health); **BARR, ROBERT N.; BAUER, HENRY; KLEINMAN, HERMAN; JOHNSON, EUGENE A.; and COONEY, MARION K.:** *Minnesota studies of oral poliomyelitis vaccine: Community spread of orally administered attenuated poliovirus vaccine strains. Public Health Reports, Vol. 76, October 1961, pp. 903-914.*

The three types of oral live attenuated vaccines were fed separately to 20 percent of the 371 families in a small community. The spread of the three vaccine strains to a placebo-fed control group constituting an additional 20 percent of the community was observed for a period of 8 weeks. Spread to the control group was measured by isolation of the viruses from stool specimens and serologically.

Type 3 vaccine spread the most and type 2 the least. Usually no more than

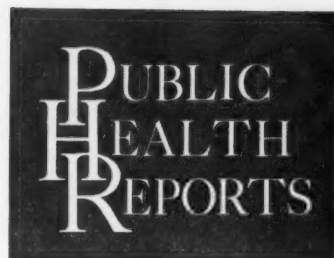
one type of vaccine spread to any individual or family. More children (23 percent) and infants (17 percent) were infected by spread of the vaccine strains than were adults (6 percent). The observed spread represented 11 percent of the total potential community spread. No clinical illnesses attributable to the vaccine were observed in the individuals or families who acquired the vaccine strains by natural spread.

CONTENTS *continued*

	<i>Page</i>
1960 summary of disease outbreaks and a 10-year résumé. <i>Carl C. Dauer</i>	915
Employment outlook for the handicapped. <i>Ewan Clague</i>	923
Progress in reporting mental hospital statistics.	925
Treatment of early syphilis with erythromycin. <i>Aston B. Greaves</i>	929
Rapid reagin test with unheated serum and new improved antigen suspension. <i>Joseph Portnoy, Hilfred N. Bossak, Virginia H. Falcone, and Ad Harris</i>	933
Undergraduate colleges of physicians.	937
Milk sanitation honor roll for 1959-61.	939
Short reports and announcements:	
Air pollution—Abatement orders. Legal note.	852
Eosinophilic meningitis on Tahiti.	856
Hospitals for Indians.	870
Poison control centers.	878
Minnesota's alcohol education program.	896
Glaucoma detection program.	902
Smoking: medical research and practice. Exhibit.	914
Publication announcements.	932
International mail pouch.	936
1960 census data for small areas.	938
Federal employees' health plans.	942
Federal publications.	943

Published concurrently with this issue:

PUBLIC HEALTH MONOGRAPH NO. 66. . . . Baccalaureate
Origins of 1950-59 Medical Graduates. *William A. Manuel
and Marion E. Altenderfer.*
Summary and information on availability appear on page 937.



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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

ABRAHAM RUBICOFF, *Secretary*

PUBLIC HEALTH SERVICE

LUTHER L. TERRY, *Surgeon General*

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GREAVES, ASTON B. (District of Columbia Department of Public Health): *Treatment of early syphilis with erythromycin.* *Public Health Reports, Vol. 76, October 1961, pp. 929-932.*

Twenty-nine dark-field positive primary and secondary syphilis patients were treated with a total dose of 10 gm. of propionyl erythromycin orally over an 8-day period. Serologic examinations were performed each month for 6 months after completion of treatment and at the end of the 9th and 12th months. The genitalia, skin, mucosa, and anus were inspected each time a blood specimen was taken.

Half of the patients tolerated the medication well. Drug intolerance when present was referable to the gastrointestinal tract. *Treponema pallidum* usually

disappeared from lesions 3 or 4 days after treatment.

Of the original 29 patients studied, 5 were recalcitrant and were lost from the project, 4 became reinfected, and 3 were treatment failures. The failure rate was 3 in 20 cases, or 15 percent. Seventeen patients completed the 1-year study. Nine of these became seronegative and the serum of another, weakly reactive.

It is concluded that propionyl erythromycin shows significant promise as an antisyphilitic drug, but a dose of 10 gm. does not produce a cure comparable to that obtained with the best schedules of penicillin.

PORTNOY, JOSEPH (Public Health Service), **BOSSAK, HILFRED N.**, **FALCONE, VIRGINIA H.**, and **HARRIS, AD**: *Rapid reagin test with unheated serum and new improved antigen suspension.* *Public Health Reports, Vol. 76, October 1961, pp. 933-935.*

Lack of uniformity in techniques for performing rapid reagin tests with unheated serum has hindered syphilis control measures. With the development of a new improved antigen suspension of greater stability, it seemed appropriate to evaluate its reactivity with unheated serum. At the same time, three methods of performing the unheated serum reagin test were compared in order

to select a single technique for use with unheated serum.

No significant difference in reactivity between these methods was observed. In the interest of uniformity, it is recommended that the unheated serum reagin test be performed on a 14 mm. paraffin-ringed slide, using 0.05 ml. of serum and $\frac{1}{45}$ ml. of new improved antigen suspension.

Health Needs of the Nation

SURGEON GENERAL LUTHER L. TERRY

NATIONAL HEALTH is nothing more nor less than the health of every State, every community, and every individual. All of us share the responsibility for solving three major health problems.

The first is the changing pattern of disease in our growing population. The past two decades have witnessed the virtual conquest of bacterial diseases. In that period, chronic diseases have continually risen in prominence as causes of death and even more so as causes of prolonged disability. This problem is closely associated with the medical needs of the aged, since cardiovascular disease, cancer, and metabolic diseases strike most severely in the later years of life. But chronic conditions also inflict the highest disability rates in all age groups, from early infancy through the most productive years of adulthood.

The second problem is a corollary of the first; namely, the provision of comprehensive health care for 180 million people. The core of this problem is our lack of facilities and personnel and of effective organizations for the application of medical science to human needs. We need more efficient systems of financing medical care for aged and dependent groups. Modern medicine has a vast array of preventive, curative, and restorative techniques, and if these were readily available to all segments of the population in all communities, we could anticipate a substantial reduction in costly long-term disability.

The third problem is the emergence of new environmental threats to life and health. These

include ionizing radiations, chemical wastes in the atmosphere and water resources, and the use of new chemicals in foods and domestic products. Both rural and urban populations are confronted with increased exposures to these hazards.

Our hopes for ultimate success in solving these major problems depend upon one common factor: continued progress in the health sciences. During the past 15 years, our national health policy has given highest priority to the expansion of medical research. The result has been greater advances in scientific medicine than in any prior period.

We can anticipate further medical advances under that policy. But many problems in the life sciences remain unsolved; many research areas affecting human health are little explored. Notable among these areas are the environmental sciences, the behavioral sciences, and administrative research. Also of critical concern is the fact that the health professions in many parts of our country lack the essential support of strong research programs.

Chronic Illness and the Aged

In considering chronic illness, we need to bear in mind the great population changes that are taking place. The nation's population totaled 180 million in 1960, an increase of 18.5 percent over 1950. The two groups with the highest rates of growth were the children and the aged. The child population under 18 years of age increased 37.6 percent and the aged over 65 years increased nearly 35 percent. These trends will continue for the next few decades, with a predicted total population of 214 million in 1970.

In States like Alabama, where population growth is slow, the proportional increase of the

Dr. Terry, Surgeon General of the Public Health Service, delivered the address on which this paper is based before the joint session of the Alabama Legislature, Montgomery, Ala., July 18, 1961.

aged population may be much higher. For the nation as a whole, the aged increased at a rate almost twice that of the total population in the past decade. Alabama's aged population increased by 31.5 percent, a rate more than four times that of the State population as a whole (6.7 percent).

There are ample data to document the special health problems of the aged. At least 77 percent of persons 65 years of age and over have one or more chronic ailments. These conditions do not always disable, but more than 6 million older people who are not in institutions report some limitation of their usual activities as a result of chronic conditions. About 2 million in that group are invalids in the commonly accepted sense of the term, that is, they are in chronic ill health and disabled for active life.

Approximately half a million older people are in nursing homes and similar institutions and another quarter of a million or more are in mental hospitals. From past experience, we know that in most of these institutions, the elderly patients are very old and very sick, and are receiving inferior service and very little medical care.

The high prevalence of chronic illness in the aged has stimulated national concern to find a satisfactory system for financing their medical expenses. President Kennedy has proposed the extension of our social security system to provide health insurance for aged beneficiaries. In my opinion, that is the logical, the most satisfactory approach. Our experience with other approaches indicates that for the majority of old people, the action is too little and too late. Whatever the nation's decision is in this matter, there can be no doubt in anyone's mind that we must be prepared to provide more and better medical services for increasing numbers of older people.

The chronic diseases, which cause the largest volume of prolonged disability, may have their onset at any time of life. There are about 70 million persons in the United States with one or more chronic conditions. Less than half of these (32,147,000) are 45 years of age and over. In these groups, however, the rate of chronic illness as well as its severity increases sharply with age. Among persons 45-64 years old, 56 percent have chronic ailments, and that rate in-

creases to 83 percent at age 75 and older. The percentage of persons with partial or major limitations due to chronic illness increases progressively from 13 percent in the younger group (45-64) to 55 percent in the older.

The health professions have long recognized that the best hope for coping with chronic disease is a preventive approach. In 1947, the American Hospital Association, the American Medical Association, the American Public Health Association, and the American Public Welfare Association issued this joint statement:

"The basic approach to chronic disease must be preventive. Otherwise the problems created by chronic diseases will grow larger with time, and the hope of any substantial decline in their incidence and severity will be postponed for many years."

The earlier a chronic disease is diagnosed, the better the prognosis. If appropriate treatment is instituted promptly and medical supervision is maintained, the patient may live a long, active life with relatively little residual disability. This has been my experience as a clinician in the management of many cardiovascular patients.

It is true that a vast amount of basic and clinical research must be done before we have "sure cures" or simple preventive measures for most of the chronic diseases. In fact, as medical science advances, the more complex the causation of disease appears. But medicine has accumulated a battery of remarkably effective preventive weapons against chronic conditions in the past 15 years. The prophylactic use of antibiotics, for example, has sharply reduced the incidence and mortality of rheumatic heart disease and subacute bacterial endocarditis. Anticoagulants have given a new lease on life to patients who survive their first coronary attack. The use of steroid compounds to suppress rheumatoid inflammation has prevented severe crippling in many arthritic patients. Exchange transfusions for Rh negative infants have virtually eliminated one form of cerebral palsy.

In addition, advances in diagnostic techniques have greatly increased efficiency in discovering serious chronic disease at a time when the chances of cure are best. Among these are improvements in the electrocardiograph and the electroencephalograph, the use of the tonom-

eter to detect glaucoma, and the cytological test for cancer of the uterus.

In sum, the "prognosis" for a national attack on chronic disease is far better than it ever has been in the past. We need to continue and to expand our research effort. This we will do, but we must begin now to apply throughout the country all the gains we have made in scientific knowledge and medical skill.

Comprehensive Health Care

The second major health problem that confronts this nation is the provision of comprehensive health care.

In his first health message, President Kennedy recognized the importance of this national problem, and he has emphasized it in subsequent special messages. In his recommendations for community health facilities and services, the President stated that the ability of families and individuals to purchase health care is of no avail if their communities do not have the necessary facilities and services.

The concept of comprehensive health care has emerged within the past decade as scientific progress has taught the health professions that there can be no separation of their basic responsibilities: prevention, care, and restoration.

In the distant past, it was possible to separate our very few preventive measures from the treatment of acutely ill people. Later on, a few surgeons seized the opportunities offered by their care of severely wounded soldiers to develop rehabilitative, or restorative, medicine. After the war, rehabilitative services were extended to the industrially injured and subsequently to a larger group of handicapped persons in our national programs for crippled children and vocational rehabilitation.

The goal now is to make sure that preventive, curative, and restorative services are available to all persons who need them, at the times they are needed, and wherever they are needed.

The core of the comprehensive medical care problem is facilities and personnel, and it is inextricably linked with the costs of health services. Medical care prices have risen more than 40 percent in the past decade, twice the percentage increase in the average price of all consumer goods and services for the same period. There is no indication that this rising trend in

prices will halt, and there has been no corresponding increase in the income of the aged in the same decade. Moreover, private carriers of health insurance, with few exceptions, have not offered to the aged the same coverage and benefits that they offer to younger groups.

Improvement of community health facilities and services will not reduce the nation's annual medical bill of \$25 billion. In fact, if all our medical knowledge were applied wherever and whenever it is needed, that bill for a growing population would be substantially higher. The American people, however, want the best that medicine can provide. They have financed the scientific research that makes advancement possible. They will, I feel sure, find ways to pay the price of better medical care.

As a nation, we have made substantial progress under the Hill-Burton program in reducing the deficit of general hospital beds, particularly in rural areas. In 1948, when construction began under the program, we had only 59 percent of the needed general hospital beds. By 1960, the States reported that 80 percent of the national need had been met.

A growing and mobile population has sharply increased the need for general hospitals in suburban areas, however. Also, many of our oldest and most famous hospitals in central cities urgently need new facilities. Of special importance is the development of adequate teaching, research, and service facilities for the nation's medical centers.

The most serious deficits in service facilities are in nursing homes, in new types of facilities for the intensive treatment of mental patients, and in rehabilitation facilities. As of January 1, 1960, the national deficit in nursing home and chronic disease beds was reported to be more than 500,000. Both types of facilities provide long-term care, chiefly for the aged. Legislation now before the Congress would authorize an additional \$10 million in Hill-Burton grants for the construction of nursing homes. If this increase is provided, the combined funds for chronic disease hospitals and nursing homes would total \$40 million a year in grants. If States and communities utilize these grants, it will be possible to add about 10,000 nonprofit beds for long-term care each year. It can be expected that commercial nursing home facilities

will continue to increase, and probably at a faster rate under expanded Federal-State programs for medical care of the aged.

The nation's needs for teaching and research facilities in the health field are intimately associated with our shortages of professional personnel.

The shortage of physicians and dentists has been an ever-increasing problem for the past two decades. The national ratio of physicians to population has remained about the same, 132 per 100,000, in a period of great and rapid population growth. Many parts of the country are not as well off as they were in 1940.

We need to strengthen and expand our existing schools; and we need to build new ones. We need to recruit our best young men and women for careers in the health professions.

President Kennedy's recommendations for educational assistance for health professions would authorize a 10-year program of matching construction grants for medical, dental, and public health schools, at a rate of \$60 million a year. New schools or major expansions of existing schools would receive up to 60 percent of costs in Federal grants, while the ratio for renovation would be 50-50. The proposal would also extend the Public Health Service construction grant program for research facilities for 3 years and increase the authorization to \$50 million a year. The recommendations would make available scholarship grants to medical and dental schools for aid to students requiring financial assistance. The schools would also receive instructional grants equivalent to \$1,000 per Federal scholarship holder.

These proposals have had wide approval from the professions and the public. They would make a start toward meeting the longstanding deficits in professional health personnel.

Many States with severe economic problems have made heroic efforts since World War II to strengthen their educational and health programs. These problems are complex, they are difficult to solve, and their solution is costly. I believe, however, that State governments face a broader responsibility in relation to health than ever before. Federal aid in various fields, notably medical research, hospital construction, and public health programs, has been substantial over the past decade. I believe that it will

increase and extend into new areas, but the Federal Government cannot carry the entire burden of public responsibility for growing health needs.

I believe that in the next decade the increase in service occupations will be a tremendous source of economic development. Automation in industry will create many new jobs requiring higher levels of education and training. So also in health services, advances in science and technology will create new opportunities demanding special skills. The kinds of specialists and technicians employed in comprehensive health services already have increased. Today there are four professional health workers for every physician. These additional workers provide the nursing care, the laboratory and pharmacy services, and many of the special treatments, such as physical therapy, which the physician requires in the management of his patients. He is responsible for making the diagnosis and prescribing the treatment, but an army of professional and technical personnel carry out his instructions.

Most of these services are available in the modern hospital. But if we are to provide comprehensive health care for 180 million people we must find ways to bring more of these services to the people—in their own homes, in nursing homes, and in facilities for ambulatory care. It is wasteful of professional personnel and funds to keep patients in hospitals beyond the time when the full battery of specialized hospital equipment and service is needed.

Organized community services to provide comprehensive health care outside the hospital are available in only a few parts of the country. Yet where even partial programs are in operation, their values in improving the health of the people and reducing the costs of care have been demonstrated.

For example, simple exercises and other therapeutic measures can have patients who survive stroke walking within 2 months of the attack. The longer the period before these measures are instituted, the longer the patient is flat on his back, and the harder it is to restore function. But even severely paralyzed patients, after lying in bed for years, have recovered enough function to take care of their daily personal needs.

This particular method of carrying out the restorative phase of comprehensive health care is probably the least expensive technique in the entire medical armamentarium. Properly instructed, any intelligent adult can do what is needed for the stroke patient; and the patient is soon exercising himself.

If this is known, why are so many victims of stroke "permanently and totally disabled"? The basic reasons are related to education of the health professions, traditional ideas of what severely ill patients can and cannot do, and the tendency in nursing homes to keep patients in bed and docile. But health departments all over the country are jumping at the chance to put rehabilitative measures into operation. For example, the Georgia Department of Public Health and the Emory University School of Medicine have teamed up, with help from the Public Health Service, for this purpose. They are providing community services to institute restorative techniques in nursing homes and the homes of stroke patients.

President Kennedy's proposal for strengthening community health facilities and services would increase Public Health Service grants to the States for these purposes. It would expand efforts to improve the quality of care in nursing homes, as well as programs for chronic disease control. It would encourage the development of comprehensive health care programs in local communities. And it would provide support for special projects in public and private organizations designed to develop new and better methods of delivering comprehensive services.

Environmental Health

The third major health problem, new environmental hazards, has been advancing upon us for 20 years. The principal areas of concern are water and air pollution, the use of new chemicals, and ionizing radiation. Within these broad fields there are the specialized problems of industrial workers exposed to new processes and the concentration of environmental problems in metropolitan areas.

In the main, these problems are byproducts of technological progress. They are accompanied and exacerbated by population growth and increased urbanization. As a result, the

American people are confronted with a dilemma: How can we create a healthful environment, conserve our natural resources, and at the same time retain the benefits of industrial technology? These benefits have added immeasurably to the convenience and, in many ways, to the healthfulness of daily living. But they have also imposed heavy hidden burdens on human health and on the economy.

Water pollution has driven up the costs of industrial production and of municipal water supplies. It has seriously depleted the nation's fish and wildlife and its recreational areas. It has had adverse effects on animal industry and agriculture. And it is a very real and present danger to human beings.

Last February, there was an outbreak of infectious hepatitis in Pascagoula, Miss., which eventually totaled 80 cases in Pascagoula and Jackson County, Miss., and in Troy and Mobile, Ala. Epidemiologic studies by the Public Health Service traced the source to raw sewage discharged into the Pascagoula River, which eventually infected oysters which the victims had eaten. The shellfish were harvested from presumably safe reefs in the coastal area.

In investigating this puzzling outbreak and halting its spread, the health departments of Mississippi and Alabama and the Mississippi Marine Conservation Commission cooperated with the Public Health Service. Later this year water pollution was the source of another outbreak of infectious hepatitis in New Jersey and New York. This outbreak was traced to clams taken from Raritan Bay. These two disease outbreaks emphasize that water pollution knows no political boundaries, and that it affects both fresh and salt water resources, long distances from the point of waste discharge.

Air pollution from industrial and domestic sources and automotive traffic is a recognized problem in all metropolitan areas, and a serious one in many. The production and use of chemicals and ionizing radiation have added enormous dimensions to the environmental problem. It is further complicated by the lack of uniform laws and regulations in this great national complex of State and local jurisdictions.

What can we do about it? The first need is for a greatly expanded national research, train-

ing, and development effort in the environmental sciences, comparable with our efforts in medical science, aeronautics, and space research. Lack of scientific knowledge and efficient control equipment is the chief handicap which deters governmental agencies at all levels in their efforts to protect natural resources and human health. So far as health is concerned, the great unknown is the biological effects of small, intermittent doses of radiation and new chemicals over long periods of time.

A second major need in environmental health is for funds and a coordinating mechanism to bring together specialists in a wide variety of fields at national, State, and municipal levels. The objective would be to apply interdisciplinary analysis, planning, and logistics to specific problems, as well as to the total environment of different regions or metropolitan areas.

The Public Health Service has had responsibilities, including some regulatory duties, in environmental fields since early in this century. It acquired additional responsibilities, particularly in water and air pollution control and radiological health, during the 1950's.

One of our goals now is to speed water pollution control, especially through increased research, training, and financial grants to municipalities for the construction of waste treatment facilities.

We expect also to expand research, training, and technical assistance in all environmental fields. President Kennedy has requested funds for the site acquisition, planning, and design of a National Environmental Research Center. Various field centers, some of which are already in being, will be developed to conduct field investigations and provide technical assistance to adjacent regions.

Role of Governments

The problems and programs I have mentioned represent only a sample of the nation's health needs and resources. In all these areas and in others, public and private resources have poured into the breach to meet urgent needs. If this were not so, American medicine and public health would not have attained their present high levels of proficiency. Without

public and private action, we would not have our universities, hospitals, health departments, voluntary agencies, and pharmaceutical and instrumentation industries.

In certain areas, joint planning and action by public and private organizations has brought about sustained progress over the past two decades. Usually, the beginnings have been small; but in some instances the results have been spectacular. Two notable examples are the national medical research effort and the national hospital and medical facilities program. Both have gone from strength to strength largely as a result of the active cooperation of professions, governments, industries, nonprofit institutions, and voluntary associations. This great complex of private and public resources is now called upon for similar efforts in different, but closely related, areas. Concerted action has made possible every significant advance in the nation's health services. The contemporary problems are certainly more complicated than those of the past, but they are no more difficult to solve—if there is a will to solve them in the public interest.

Future progress in comprehensive health care, in education of the health professions, and in environmental health will depend in large measure on clear understanding by public and private groups of their respective responsibilities. Health needs in a nation of high material prosperity sometimes have a "low visibility" in comparison with other more obvious demands. Health needs are continuous. In a growing population they cannot be met by single actions expected to fill the bill for a generation.

In the United States, governmental agencies and institutions derive responsibilities and funds from the representatives of the people in Federal and State legislatures. Over the past quarter of a century, our national policy for community health facilities and services has been to provide Federal grants to the States, accompanied in some instances by other forms of assistance. The intent of the Congress has been to provide proportionally larger financial aid to the jurisdictions with low per capita income. This policy has been pursued consis-

tently in Federal-State programs operated by the Public Health Service, the Social Security Administration, and the Office of Vocational Rehabilitation.

The pattern of Public Health Service grants for health research, training, and research facilities construction has been different. Here the aim has been to build up the nation's scientific potential through support of institutions and individual scientists. The same pattern has been applied in our programs for the advanced training of public health specialists and nurses.

In both these programs, research and training institutions in all parts of the country have benefited, whether operated under public or private auspices.

A second goal of these programs, aided by the Hill-Burton program, is to strengthen the nation's medical centers. These are at present the source of medical leadership in teaching, research, and clinical service—and the hope of the future.

State and local governments traditionally have borne the major burden for public health services. In the past decade, the proportional contribution of the Federal Government in those fields has declined, while that of State and local governments has increased sharply. This increase has occurred even in States with relatively meager economic resources.

State and local governments are also being called upon to play a larger role in types of health activity new to most of them. I refer particularly to research, education of the health professions, construction of community facilities, and administration of medical care programs covering larger segments of the population than previously came within their purview. The prominent role that private institutions have played in these areas will not, and must not, diminish. On the contrary, their role must increase. We cannot sustain progress in national health without substantial expansion of support from all sources. The stress of competition with other large national demands already has had an adverse impact on the nation's health institutions and agencies.

As a medical administrator, I know that high-quality research, teaching, and service in my

field cannot be performed without adequate support for personnel, facilities, and administration. In health fields, nothing less than high quality will suffice, for these activities touch people—in the most poignant experiences of their lives.

If expenditures for health lag too far behind increasing costs and increasing demands, the quality of health activities will deteriorate in the long run. If pressing demands for other civic needs are allowed to crowd out health needs, the effect on the economy of a State or of a nation can only be disastrous. In practical terms, achievements in other fields depend ultimately on a healthy, productive population. Development of health resources must keep pace with action in other areas of civic effort.

My contacts with other medical administrators in private and public organizations lead me to believe that the crowding out of health needs is occurring in many States. In others, there is a "slowing up" of support for new activities launched with enthusiasm only a few years ago.

The nation's medical centers, hospitals, and health departments cannot carry out the missions for which they were created without solid, sustained support. Nor can governments and private organizations afford the wastefulness of inadequate health resources.

These challenges confront the entire nation. We need to move forward now in a concerted effort to increase national health resources. Buttressed by an expanding research effort in all fields, our facilities, personnel, and organizations should be able to provide for the American people all the comprehensive health care and all the protection against environmental hazards that science affords.

But the nation's leaders at all levels of government must pick up the challenge wherever public responsibility is a factor in meeting the health needs of the nation. The health professions can identify these needs. They can point out the great opportunities for health progress. They can deliver the service. They can suggest ways to improve efficiency. But they cannot provide the means to accomplish them. Let it not be said that the world's richest nation in all history failed to meet the people's health needs.

Legal Note . . . Air Pollution—Abatement Orders

Order which directed defendant to cease to "cause, suffer, allow, or permit open burning of refuse" held too vague to be enforceable when defendant did not cause fires in his open refuse dump. *Department of Health v. Rosselle* (N.J. Supreme Court 1961) 169 A. 2d 153.

The defendant appealed from a court order obtained by the New Jersey State Department of Health which held the defendant in civil contempt for failure to comply with a judgment of a lower court requiring the defendant to "cease violating the New Jersey Air Pollution Control Code as promulgated by the Air Pollution Control Commission" on premises operated as a refuse dump. The code provided that "No person shall cause, suffer, allow, or permit open burning of refuse . . ." Under the New Jersey Air Pollution Control Act the health department enforces the Air Pollution Control Code (N.J.S.A. 26:2C-9).

The charge revolved about the outbreak of fires in the defendant's dump, the origin of which was unknown. The health department conceded that the defendant had not started the fires and could not account for their origin.

On the merits of the case, the court held that enforcement of an injunctive order, such as at issue here, would not be denied merely because the violation was not willful. It held, however, that the order was too vague to sustain a finding that the defendant had violated it.

The court noted that, under the statute, upon a finding after a hearing that a violation of the Air Pollution Control Code existed, the health department was authorized to direct the taking of "such measures as may be necessary to prevent the same" (N.J.S.A. 26:2C-18). Thus, the court said, the statute directs the department to determine "in plain terms" what shall be done.

Since it was admitted that the defendant had not caused the fires, the violation of the code must rest on the charge that he did in fact "suffer, allow, or permit" the fires to occur. The only testimony offered, however, was proof of the fires and there was no evidence concerning measures the defendant should have taken, beyond what was done, to prevent or fight the fires.

The court noted that in the hearing held by the control commission prior to the adoption of the code it was pointed out that fires in open refuse dumps are frequently caused by the dumping of hot

ashes, by spontaneous combustion, or by strangers to the operation. Sanitary landfills and incineration do not create the risk of such fires. The commission, however, chose to permit the continuance of open dumping in which the outbreak of fires was likely. (On June 30, 1960, the sanitary landfill method became mandatory for all dumps throughout the State.)

Under these circumstances the court held that the defendant was entitled to know in advance the specific measures which the department would deem sufficient to comply with the statute. The court pointed out that so long as the fires continued to break out, the defendant was required to risk the hazard of prosecution no matter what he did, and declared: "Any liability for the statutory penalty should not depend upon a defendant's ability to guess what will be found to be a sufficient provision to prevent fires or to extinguish them." The measures, said the court, "whatever they are, should have been specified in the departmental order" as contemplated by the statute.

The court criticized the order further, saying: "Nor, in terms of future compliance, can a restraint of such lazy generality be a truly effective remedy in the public interest. As the litigation demonstrates, it merely delays a solution by inviting controversies over what was meant and the sufficiency of what was done. Plaintiff increases its own workload when it resorts to generalities since sooner or later they must be made concrete. Plaintiff should use its ample power to deal with the problem with decisive clarity."

The court accordingly denied the health department's motion to punish the defendant, and left it to reinstitute its administrative procedures to abate the air pollution.

Comment. The court's holding emphasizes the administrative responsibility to decide clearly what the defendant is to be required to do, and to spell out the required measures in appropriate orders.

—SIDNEY EDELMAN, *assistant chief, Public Health Division, Office of General Counsel, Department of Health, Education, and Welfare.*

Accident Prevention and Nursing

GRACE MATTIS, R.N.

THE AVOIDANCE of accidents depends to a much larger extent on individual understanding and action than does the prevention of infectious diseases. The nurse in her work in prenatal and well-baby clinics, in school and industrial health programs, in home visits—in fact, in any health work with individuals and families—needs to find ways of helping people develop this understanding and motivate them to take positive action with regard to safety. The nurse can inform persons as to the hazards around them, help them evaluate the risk they take when they perform an unsafe act, and teach them to consider the probable consequences of their actions to themselves and others. For example, a person who smokes in bed knows that he may fall asleep; nevertheless, he takes his chances with a lighted cigarette. Is it worth the small luxury of smoking in bed to risk being scarred and crippled? Raising such questions is part of the nurse's responsibility in helping to develop the competence of each family with whom she works. At the same time, the questions and answers alone do not satisfy the need.

This was brought to my attention recently when a friend showed me a small book entitled "Home Care of the Sick and the Prevention of Diseases." This book was published about 1925-26. It contains a chapter on accident prevention which states that in the home the first thought should be given to the prevention of accidents to children. Railings should be used on stairways; kerosene should be kept under lock and key, and so on. Some 30 years later we are still saying these same things without remarkable results.

More than a knowledge of hazards and their

role in accident causation is needed for effective nursing participation in a community accident prevention program. A knowledge of the nature and extent of the problem and its relationships to other health problems in the community is necessary.

In the past, accident prevention activities have been characterized by a concern with the environmental causes of accidents. While considerable progress has been made through this approach, and it is necessary that we continue to be concerned with the environmental aspects of accident prevention, still the human factors need attention, especially from nurses and sanitarians.

Although many believe that simply by showing how accidents happen people can be motivated to change their behavior and act in a safe manner, we have ample proof that knowledge of facts regarding health matters cannot be equated with appropriate behavior. For example, a great proportion of the public remains indifferent to appeals for moderation in eating, drinking, smoking, and driving.

Behavioral scientists tell us that motives connected with health are at best only a small part of the vast and complex scheme of human motives (1). They tell us that even if the health motive is important to a person, he must also believe that he is susceptible to a particular health hazard and he must at the same time believe that the hazard would have serious consequences for him. It is the individual's belief about his susceptibility and the seriousness of the threat that determines his acceptance of a personal health problem. Frequently a person cautioned about an unsafe act responds, "Oh, I always do that and nothing ever happens." Clearly, along with teaching the rules of safety, one should explain the reasons for the rules.

With the multiplicity of hazards being in-

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troduced into our homes these days there is no such thing as a completely "safe" home. Most homes contain garden chemicals for pest and weed control, power lawnmowers, electrical equipment which requires heavy current, do-it-yourself equipment, detergents, medicines, throw rugs, plastic bags, and so forth. While none of these are dangerous if used properly, all have caused injuries and deaths. This situation surely indicates a need to help people learn to live safely in their environment. What people do or fail to do appears to play a very important part in accident causation.

Industry, which has an amazing record of accomplishments in making the environment safe for the worker, is now recognizing the need to study attitudes and behavior of people in regard to industrial accidents. In the President's Conference on Occupational Safety, this concept was emphasized by several speakers. One person expressed it this way: "The shift from safety of things to the safety of people is the big change in safety thinking today."

Safety for Children

Many studies have been made to determine how accidents really happen. Studies of childhood accidents show that the vast majority of these accidents can be prevented. Dietrich's theory of accident prevention for young children is "learn and live" (2). He believes that the safety of a child requires 100 percent protection during the first year of life. After this first year, while still maintaining protection, increasing reliance should be placed on education and gradual exposure. Dietrich advocates teaching a child to do safely all things compatible with his abilities and his interest. Other pediatricians are subscribing to this theory. The American Academy of Pediatrics has recently prepared a pamphlet, "Obedience Means Safety for Your Child," which every nurse who works with parents and children will find helpful (3).

In counseling parents regarding the safety of children, nurses find the following points are important:

1. Children are great imitators, and actions and attitudes of parents or guardians will be copied. It is not enough to instruct a child to

cross the street only when the light is green if the parent then darts across the street when the light is red. Good parental example is necessary if a child is to learn safe behavior.

2. Excessive limitations of a child's activities may hinder the development of his ability to cope with dangerous situations. An active, restless 4-year-old who is constantly penned in his yard by his mother to keep him from being hit by a car may be better protected by being taken into the street and trained to follow rules of safety.

3. Minor accidents are to be expected during the process of growth. It is partially through them that a child gains awareness of the world and the reality of its dangers.

4. Unsupervised infants and preschoolers are susceptible to accidental injuries.

Studies of childhood accidents indicate that in a large proportion of the accidents the injured child was not properly supervised at the time the accident occurred. It is estimated that nearly 400,000 children in this country under age 12 have to care for themselves while their mothers work (4). Of these children, 138,000 are less than 10 years of age. The Children's Bureau and the Department of Labor recently sponsored a meeting in Washington to consider what can be done to provide day care for children of working mothers. However, the practice of leaving small children at home unattended is not limited to families in which the mother is required to work; it is a rather common practice among those who can afford to provide care and who seemingly are intelligent, careful parents otherwise. Parents need to be warned that it is not safe to leave young children in the home unattended even a short time, not even the minute it takes to run next door or to the corner store. It is true that nothing may happen, but newspapers are full of reports of the tragic consequences of this practice.

Recently, 100 cases of accidental poisoning in children were studied, and it was concluded that two-thirds of the poisonings were preventable (5). In 26 cases some person other than the parents (siblings, other children, neighbors, relatives) either made it possible for the child to reach the poison or failed to put it away. In 31 cases the parent did not think that the child was able to climb, open doors, unscrew caps, or per-

form other actions necessary to get the poison. Most of the parents appeared to have some degree of safety consciousness and had tried to provide a safe place for the poisons. However, failure to put dangerous substances away in the proper places after use was one of the leading causes of poisoning among young children.

Safety Education in the School

The objective of a safety education program in the school should be to prepare the child to live safely. Prevention of accidents, as was indicated previously, does not lie primarily in devising more and more safety devices, however important these may be, but in improving man's knowledge, skill, attitudes, and habits.

An indication of the need for improved safety teaching in schools was revealed by a survey of some 5,000 school children in six urban and six suburban communities in the eastern United States (6). The survey pointed out the prevalence of certain harmful health and safety misconceptions held by 5th, 6th, and 10th grade children. These misconceptions and the proportion of children who held them were rather shocking:

- About 75 percent of the children thought that the only good way to help a drowning person is to jump in the water to save him.
- More than half of the children thought that it is usually safe to go in swimming alone, if one knows how to swim.
- Many thought that a bullet cannot go off unless it is fired by a gun; oil, grease, and gas fires should be put out with plenty of water; if clothing catches on fire a person should always run for water; and bicycle riders do not have to obey traffic lights.
- Twenty-six percent of the 10th graders thought it was all right to point a gun at somebody if one is sure it is not loaded, and 60 percent agreed that people should walk on the right-hand side of the road if there are no sidewalks.

One has only to look at the death rates from firearms, drownings, and pedestrian accidents to understand the significance of this study. Nurses who have responsibility for school health work can be helpful to classroom teachers in developing safety programs and cur-

riculum content. Responsibility for such teaching, however, belongs to the classroom teachers; the nurse's function is chiefly advisory.

The Aged

In a high proportion of home accidents, the victims are elderly. Two-thirds of all accidental injuries to persons 65 years of age and older occur in the home. Nurses need to understand that care and foresight by those responsible for the care of the elderly can do much toward decreasing the risk of accidental injury. It does little good to admonish an oldster to be careful. This may only induce anxiety and irritation and thus cause the individual to be more susceptible to accidents. As with children, the approach should be through the person responsible for the welfare of the oldster. The nurse in her home visits can observe conditions and situations that might cause accidents, and she can then suggest practical aids and techniques to add to the older person's comfort and safety.

Specific Tasks

In addition to those activities which I have mentioned, the following are some of the many specific contributions nurses can make toward accident prevention:

- Emphasize safety in all teaching during home visits, especially in maternity, infant, and child care, and care of the aged.
- Include in all group teaching a discussion of home accident prevention techniques. This probably can be done most effectively by incorporating safety into the subject being discussed.
- Include home safety education in school health programs through teacher-nurse and pupil-nurse conferences and in all school activities in which nurses participate.
- Participate in epidemiologic studies of home accidents.
- Cooperate with industry to incorporate home safety education into occupational safety programs.
- Observe and record situations in the home environment that might predispose to accidents. Recording should include recommendations and corrections.

- Include safety as part of the training of nursing aides in nursing homes. Safety of nursing home personnel as well as patients should be emphasized.

- Every nurse can learn the technique of mouth-to-mouth resuscitation and, when possible, teach others. As part of civil defense nurses are being taught this technique.

Accidents kill more children and young adults than any single disease in our country today. Surely increased attention and effort by nurses to help prevent this needless loss of life is warranted.

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Eosinophilic Meningitis on Tahiti

A mysterious outbreak on Tahiti of a disease, clinically described as eosinophilic meningitis, is under investigation by Dr. Leon Rosen of the National Institute of Allergy and Infectious Diseases, Public Health Service, and Jacques Laigret and Serge Bories of Tahiti. A report on their findings to date appears in the August 1961 issue of the *American Journal of Hygiene*.

The scientists seek to determine whether the disease is caused by a nematode recovered for the first time by Dr. Rosen from the brain of a patient who died recently in a hospital in the Hawaiian Islands. An autopsy on the Hawaiian patient disclosed young adult nematodes in both brain tissue and meninges. Cerebrospinal fluid obtained prior to the patient's death showed changes typical of those seen in Tahitian patients with eosinophilic meningitis. The condition of the patient, however, made it impossible to determine whether his symptoms were similar to those of the Tahitian patients or whether death was due to eosinophilic meningitis.

The postmortem findings, after a cooperative investigation with the Hawaii State Health Department and St. Francis Hospital in Honolulu, indicated that the nematodes, *Angiostrongylus cantonensis*, are a type found in rats, land snails, and slugs.

The disease on Tahiti, where hundreds of cases have occurred since 1958, resembles other types of

meningitis in its painful and paralytic symptoms, the most common of which are headache and stiffness of the neck and back. Since no ideal treatment exists, the cause must be found before preventive measures can be established.

Cerebrospinal fluid changes in patients provided the investigators with the first lead in studying the Tahitian outbreaks. Clinical, laboratory, and epidemiologic determinations subsequently ruled out all known diseases which cause similar changes. Poisons, viruses, bacteria, fungi, protozoa, and worm parasites were then considered as possibly responsible for the disease.

Months of laboratory analyses, direct examinations of patients, and door-to-door interviews narrowed the field of suspicion to parasitic worms. The investigators found no evidence that the parasite was transmitted from person to person or that it was mosquito borne. The fact that the infection came in "waves" and attacked several members of a family simultaneously suggested a common source of food as the carrier of the parasite.

Fish were examined for parasites after several persons became ill from eating raw fish at a family reunion feast. Although it was not possible to perform spinal taps on all individuals, 10 persons had symptoms compatible with the disease.

The Public Health Nurse's Expanding Responsibilities

ZELLA BRYANT, R.N., M.P.H.

PUBLIC HEALTH nursing responsibilities are generally determined by the authority, policies, and program of the employing agency. Official agencies have certain legal responsibilities and commitments which directly affect what and how much public health nurses will do for certain groups or individuals with specified health conditions. Also, the professional knowledge and skill that a public health nurse possesses and the degree to which she is effective as a person determine to a great extent the responsibility she can assume in public health programs and in the care of sick and disabled persons. Little attention, however, seems to have been given to some of the other factors affecting public health nursing practice.

This article is concerned with some of the influences outside the employing agency and apart from the nurse herself that affect what the nurse does and how she does it. Three examples of such influences are (a) discoveries in science and medicine, which come in ever-increasing number from research laboratories, (b) development of resources that were not previously available to the people, and (c) demands of an interested public for a service that the people want and believe they need.

Discoveries in Science and Medicine

A public health activity may be started, stopped, or changed because of a scientific discovery. For example, when poliomyelitis vaccine was developed and used, public health nurses started new activities in connection with vaccination. Less time was required for the care of patients because there were fewer of them, although the nurses continued their

work with those already crippled by this disease. They shifted their educational emphasis from early treatment to prevention through immunization. Only time will tell what changes will be brought about by the use of oral vaccine. Because of similar past developments in acute communicable diseases, some young public health nurses have never seen a case of diphtheria. But diphtheria immunization programs continue, and public health nurses are active participants.

The recent development of drugs for the treatment of tuberculosis has greatly affected the activities of public health departments. These drugs not only treat tuberculosis effectively but help to prevent the spread of the disease by reducing the time a treated patient may endanger others. Public health nurses continue their usual duties of finding new cases, seeing that contacts and suspects receive the necessary diagnostic services, identifying the source case and persons who may have been infected, and assisting patients in obtaining medical care and drugs. But counseling by the public health nurse has changed; by placing more emphasis on adequate treatment, she now offers the patients greater hope for recovery.

The marked reduction in the number of deaths and newly reported cases of poliomyelitis and tuberculosis does not mean curtailment of the amount of time public health nurses need to spend on continuing control of these diseases.

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Also, although an effective and quick method of treating venereal diseases exists, considerable time is needed for the constructive counseling of teenagers, the most vulnerable group.

As science enables us to control diseases caused by virus infections, as it solves the epidemiologic unknowns in the spread of staphylococcal infections, and as it increases knowledge about the effects of air pollution and radiation on the health of man, public health nursing will be affected along with other public health practices. One can only surmise how scientific discoveries might be hastened if those who work in the laboratory had before them a summary of all that public health nurses know about their patients and their environment.

Development of Resources

Another factor outside the health department that affects the work of public health nurses is the development of resources not previously available to patients. In a study by the Public Health Service of public health nursing services to patients (1), the term "patient-nurse contact" was used to describe any activity with or in behalf of a patient. This study showed that in the participating health departments the largest percentage of patient-nurse contacts was for the purpose of advising and helping individuals to obtain needed medical and related services. Nurses from rural States can remember when children with orthopedic defects were about the only persons without funds of their own who could receive other than emergency care. And what a temptation it was to give an unequal amount of time to this group.

Many new services and facilities are now available to the people served by health agencies. In recent years the definition of a crippled child has been broadened, and funds are available for the care of children with a wide variety of handicapping conditions. When medical science came to the rescue of the child with a congenital heart defect, public funds were also provided for his care. Other resources, but too few in most States, are open to mentally retarded children, emotionally disturbed and mentally ill patients outside the hospital, and some who need specialized re-

habilitative services. And the availability of health and hospital insurance has resulted in care for an increasing number of people.

When new facilities are established and new services become available, changes take place in public health nursing. Careful documentation is needed to find out how and to what extent public health nursing practices are affected when a new facility is made available to patients. Certainly the public health nurse's work is more effective and satisfying when recommended care can be obtained. In one State where individual arrangements had to be made with tuberculosis associations and hospitals for each X-ray, it was found that public health nurses made an average of six patient-nurse contacts to get an X-ray for one tuberculosis patient or contact. The addition of X-ray facilities in health departments was recommended, and it was estimated that the number of patient-nurse contacts would be reduced to an average of two. A large percentage of the patients could be expected to need only a notification by mail and one conference in the clinic or home.

On the other hand, the addition of a new facility or service may result in the referral of a new group of patients, thus increasing the amount of work expected of public health nurses. For example, when new services become available to mentally retarded children, nurses are often asked for the first time to evaluate and report families' capacities to provide good physical and psychological care for a retarded infant. I suspect, however, that the availability of such resources influences to a great extent a nurse's decision as to where her efforts and time can best be expended when there is not enough time for every person who might be served.

Demands of an Interested Public

I have chosen as a third example of outside influences the demands of an interested public. Public health agencies have experienced and have often had to acquiesce to demands for sanitarians to spend time on nuisances that do not affect the public health, or for physicians and nurses to give unwarranted emphasis to typhoid immunization during a flood. They

have responded to more appropriate demands for the application of a new scientific discovery, such as the use of poliomyelitis vaccine, and they are now faced with new demands for individual services not previously offered by official agencies.

Expressions of interest in chronic illness and the problems of the aging will be found in almost any publication, whether it be a newspaper, popular or professional writing, or a report that calls for action by civic, professional, or political groups. Public demand is expressing itself through national as well as local interest in having resources developed to meet the mounting needs of the aged and chronically ill.

Federal funds for research in cardiovascular disease and cancer have been appropriated as a result of a nationwide demand for greater scientific knowledge about these diseases and for the development of control programs. Similarly, support has been forthcoming for activities such as vocational rehabilitation or care of handicapped children.

Public demand for nursing care for ill and disabled persons at home seems to be increasing on both the national and local level. Studies of citizen groups indicate that the average citizen lists nursing service for sick and disabled persons as one of the important health needs (2). In the information supplied for the White House Conference on Aging held in Washington the week of January 9, 1961, 23 States mentioned this service as an urgent need. Health department nurses, to the extent that it is possible, are giving an increased amount of time to the care of ill and disabled persons. This service cannot be offered generally without additional staff since three or four times as much nursing service is required for this type of activity as for the traditional health department services.

Some months ago the Division of Nursing was asked along with other divisions in the Public Health Service for examples of serious lags between the discovery and application of scientific knowledge. The reply to this request dealt with the time lag between the discovery and application of treatment and rehabilitative measures for ill and disabled persons at home in communities where public health nurses do not provide continuing nursing service in the

amount and type that is required. Where adequate services are not available, many patients at home do not receive the benefits of modern therapy because the physician can prescribe only what he can provide or the patient and family can carry out. This is usually true of patients who are in need of treatment regardless of age, cause of disability, or the family's ability to pay for the service.

An increasing number of communities, both rural and urban, are finding ways to provide this service. In most new programs, tax funds, voluntary contributions, and nonofficial funds are used, and patients who wish to do so can pay for the service. It has been found that patients who have been hospitalized for varying periods of time, as well as those who have never been hospitalized, need and want the service. Even patients who have had the benefits of modern therapy in the hospital often regress if continued treatment is not provided in the home. A large number of patients at home have been helped to self-care and are no longer dependent on family and friends. I hasten to say that public health nursing care alone is not the answer to patients' needs, but it is a necessary part of any home care plan, and it is essential to the success of programs that provide treatment and restorative services.

Another result of public demands are the 1960 amendments to the Social Security Act to provide medical assistance for the aged. Increased funds are available to the States for medical aid to about 2½ million people in the nation who are on old-age assistance rolls. An additional estimated 10 million others 65 years of age and older whose incomes and resources are insufficient to meet the necessary costs of medical services will be potentially eligible under the assistance category called medical assistance for the aged. The majority of these are people 65 and older who are now receiving old-age and survivors insurance benefits.

States decide whether they wish to take part and have broad latitude in determining the scope and nature of as well as eligibility for medical assistance for the aged. A State, for example, may elect to supply medical services only to old-age assistance recipients, only to those eligible for medical aid to the aged, or to both groups. A State plan must be developed by the agency

designated to administer the program, and the plan must be approved by the Secretary of Health, Education, and Welfare. If the State plan includes medical assistance for the aged, it must include some institutional and some non-institutional care and services.

Nursing is one kind of service that may be supplied. Private duty nursing receives specific mention in the law as a type of noninstitutional care that can be provided under medical aid to the aged. Home health care services are also mentioned and are generally interpreted to include other kinds of nursing services provided in the home. In order to be paid for nursing service, an agency must have a program for care of the sick and follow the practice of accepting fees for service.

Programs for nursing care of the sick are found in only a small percentage of the communities in the United States. On January 1, 1960, 662 visiting nurse associations and 47 combination agencies were reported, and only 250 official health agencies said they were offering nursing care of the sick as a part of their regular program and on a continuing basis. A special study conducted in 1959 showed that only 287 out of a total of 480 cities with a population of 25,000 or more had one of these types of agencies.

If nursing is included in medical assistance for the aged and if other groups in the population are to have needed treatment, many more programs for nursing care of the sick will need to be developed. Any widespread expansion of activities to provide nursing care in the home, whether for the aged or for the population as a whole, will need to come through the cooperative efforts of official health departments, voluntary groups, and professional organizations. A health department may help to make service available by extending its own program to include care of patients in the home, assisting in the development of a program under other auspices, or planning for more effective use of existing services.

The accomplishment of most public health undertakings, other than environmental sani-

tation, depends to a great extent on the 18,800 public health nurses who are employed by local official and nonofficial agencies which usually serve the general population (3).

In spite of new and expanded programs, the number of full-time nurses employed by local health agencies has not kept pace with the growth of the population or the expansion of public health programs. An increase of only 1,071 nurses occurred in these agencies between 1950 and 1960, or an average of 2 nurses per State per year. The number of nurses employed to serve the school age child has increased, a trend that has continued upward since 1937, with an increase of 89 percent since 1950.

The shortage of nurses is the reason most frequently given for the failure to add to the nursing staff in local agencies, but there is growing evidence that shortage of funds for the employment of nurses, the competitive market within nursing, and the lure of other occupations and professions may be equally responsible for the inadequate number of nurses in public health. Hospitals have been shocked to learn from studies how much professional nursing time was being spent on messenger, housekeeping, and clerical duties. Health agencies have been equally shocked to learn how much nursing time is spent on duties that could be carried out by clerks and aides.

The public health challenges of today are too great and too urgent for us to leave unsolved problems of short supply of nurses and effective use of available nursing services.

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Changing Concepts Concerning Cancer

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THE UNITED STATES has manifested an unswerving dedication to the solution of the cancer problem. The National Cancer Institute Act of 1937 is a concrete demonstration of the conviction that the problem of cancer can and will be solved by scientific research.

One manifestation of progress in cancer research is that our concepts regarding cancer have not remained static. A whole series of changed and changing ideas and approaches has occurred during the past few years.

This, of course, is not surprising. All of medicine shares in the technological revolution of our times. Discoveries and opportunities are upon us at a rate that exceeds available resources of men, space, and time to exploit them. Cancer research certainly is not an exception.

I have selected a few concepts concerning cancer that seem to me to reflect the main streams of progress. I shall deal with them under three general headings: (a) some biological aspects, (b) some clinical aspects, and (c) some social aspects of cancer.

Some Biological Aspects

Cancer is not an entity, but a great class of diseases with distinct etiologies, pathogenetic stages, and, probably, distinct intracellular and subcellular mechanisms and reactions.

The distinct identity of different neoplastic reactions is well illustrated by two experimental

tumor models in the mouse, the interstitial testicular tumor induced with estrogens and the adenomatous pulmonary tumor induced with urethan.

Figure 1 presents Howard Andervont's data (1) on the appearance of interstitial testicular tumors in BALB/c mice implanted subcutaneously with 5 mg. pellets containing 20 percent diethylstilbestrol in cholesterol. Each line represents a group of 50 to 75 animals. When the pellet is retained continuously testicular tumors appear in practically all mice, starting in about 7 months (line A). If the pellet is removed after 8 weeks, no gross tumors develop, although many testes have identifiable effects of estrogen months later (line B). When the pellet is removed after 8 weeks and reimplanted 24 weeks later, the reaction proceeds as indicated by line C. The appearance of tumors is parallel to the response to continuous stimulation, but is delayed by 24 weeks, the period during which estrogen was withdrawn. For this neoplasm, 8 weeks of estrogenic stimulus is insufficient. If the stimulus is withdrawn, the reaction neither progresses nor regresses, but stops at that stage, to resume without interruption upon the reintroduction of the stimulus.

Figure 2 records the induction of multiple pulmonary tumors in strain A mice that received a single intraperitoneal injection of urethan, 1 mg. per gram of body weight (2). All mice had grossly visible multiple tumors within 3 months. Microscopically tumors are identifiable by the end of 3 weeks and all appear to have been induced by the end of 6 weeks. Urethan is degraded and excreted by the animal within a few hours. Analysis of the data indicates that this neoplastic reaction is induced and completed by a single brief exposure to a carcinogen.

Dr. Shimkin, associate director for field studies, National Cancer Institute, Public Health Service, presented this paper at the Fourth National Cancer Conference, Minneapolis, Minn., September 13, 1960. The paper will be included in the forthcoming proceedings of the conference.

The growth patterns of these two tumor entities are also quite distinct. The interstitial cell tumors, on the withdrawal of estrogen, may progress, regress, or remain stationary; in animals having tumors of both testes, the two tumors may behave in a diametrically opposite fashion. The growth of pulmonary tumors, on the other hand, appears to proceed regularly and is described by a progressive decrease in rate, probably because the cells toward the center of this organoid neoplasm divide at a lower rate than those toward the periphery. Both interstitial cell and pulmonary tumors can be transplanted and both develop occasional metastases, but these features also demonstrate biological differences.

It is difficult not to conclude that even if all

neoplasms were eventually shown to be the effect of intracellular virus activation, different viruses are involved in the two processes. Or, if all tumors eventually were to be described in terms of desoxyribosenucleotide alteration, different changes are produced through different biochemical reactions.

An important new concept of cancer is that many neoplasms are the end result of a long series of progressive changes and stages rather than being the effect of single mutation-like alterations endowing cells with immutable new characteristics. We owe this contribution primarily to the work of Berenblum on skin cancer, and of Furth, Gardner, and others on endocrine gland tumors. As with any other generalization regarding cancer, there are both exceptions to and modifications of this concept. The pulmonary tumor of the mouse may represent an example of a single-event induction.

Closely related to the concepts of tumor progression and of environmental dependence is the question of whether neoplasms arise from single altered cells, or whether a population of cells has to be affected. It appears probable that here also no generalization can be made, and that examples of both mechanisms may exist.

Plasma cell tumors of the mouse exhibit specific individual electrophoretic patterns rather than the wide variety of patterns observed among plasma cells. This finding is interpreted by Potter and Fahey (3) as evidence that each tumor arises from a single plasma cell. In contrast, skin carcinomas evoked by ultraviolet radiation appear to involve the recurrent selective stimulation of a large population of cells (4).

Cancer can be defined as a disease of the cell that is transferred to the descendants of the cell (5). Yet in metazoan organisms a single cell is almost an abstraction, biologically meaningless without the interrelationship of the whole organism. A single cell that acquires the undefined characteristics of cancer is not the disease we call cancer until many cell generations later and until an interaction has taken place with the organismal environment.

One of the healthy developments in cancer research has been the increasing interest in the study of host-tumor relationships: changes that

Figure 1. Induction of interstitial testicular tumors in BALB/c mice implanted subcutaneously with 20 percent diethylstilbestrol-cholesterol pellets: A, continuous presence of pellet; B, pellet removed after 8 weeks; C, pellet removed after 8 weeks and reimplanted 24 weeks later

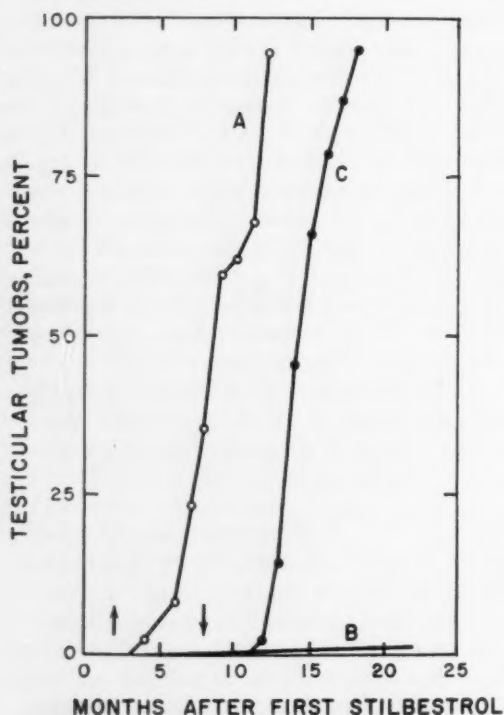
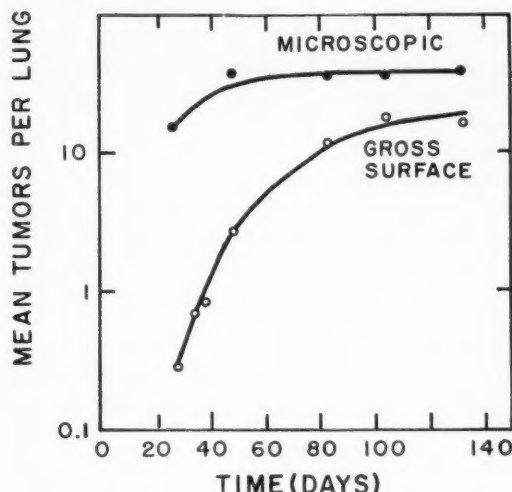


Figure 2. Induction of multiple pulmonary adenomatous tumors in strain A mice injected once intraperitoneally with 1 mg. urethran per gram of body weight, as seen on the surface and as detected by microscopy of serial sections



tumors produce in the host and, perhaps, changes that have to occur in the host before a neoplasm can develop, grow, and metastasize.

There is an impressive list of biochemical alterations in animals and in man afflicted with a wide variety of neoplasms. The late Jesse Greenstein's observations on the decrease in catalase in the presence of tumors (6) falls into this category, and lactic dehydrogenase is one of the later claimants of our interest (7). Unfortunately, all these changes take place when the tumor process is advanced, and thus they preclude implications of tumor specificity or of diagnostic utility.

One limiting factor in these investigations may be simply the dilution effect of even a million neoplastic cells in a population of 10^{13} cells that comprise an adult human body, especially when the observations are made on tissue fluids or their end products. For this reason, investigations that bring the tumor-interphase-host area into closer focus are of great potential. The late Glenn Algire (8) attempted to achieve this with implanted transparent windows and diffusion chambers. The fate of hematopoietic cells implanted subcutaneously in diffusion

chambers, as reported by Shelton (9) and by Petrakis (10) represent recent contributions of interest.

An interesting series of problems has resulted from the rediscovery that tumor cells can be found in the blood of a small but significant proportion of patients with cancer (11). The presence of tumor cells in the blood is not necessarily indicative of metastasis, just as the recovery of tumor cells in the operative field does not indicate that a local recurrence is inevitable (12). This is a forceful demonstration of the systemic factors of resistance that must exist in some patients against some neoplasms, factors that it will be fruitful to define. Also, it is excellent evidence that cancer cells and the diseases we call cancer are not the same thing.

The most active and promising recent trend in cancer research is the exploration of the viral etiology of tumors. Wendell Stanley's lucid plea at the 1956 National Cancer Conference (13) that for research purposes it be assumed that most, if not all, kinds of cancer, including cancer in man, are due to viruses, came at an appropriate time and fell on receptive ears. With typical American vigor, we have programmed this approach on a national scale and have pledged support by seven-figure financial commitments over many years. Exciting findings are being made in this field of research at a rapid pace (14).

I should like to suggest that a Nobel prize for Peyton Rous is overdue. We should also honor that doughty small group who kept on working when viruses were not allowed in many a cancer research institution: Richard Shope, J. J. Beard, Ludwig Gross, Ray Bryan, and Sarah Stewart in this country, Gye in England, and Zilber in Russia.

This praise should not be interpreted as total agreement with the concept of the viral etiology of tumors. The data for such a position are still very incomplete. Even with most well-defined animal tumor viruses, the tumor may represent a relatively late, uncommon event, perhaps rarer than the development of paralysis after exposure to poliomyelitis virus. Tumor virus may be no more equivalent to neoplastic disease than is an individual tumor cell. Also, to some traditionalists, the intrusion of a virus into some carcinogenic responses to chemi-

cals and physical agents seems somewhat akin to the addition of x to both sides of an equation.

The only value in this argument is to maintain a balance between the investments being made in virus research and in the studies of chemical and physical carcinogens, especially the complex carcinogenic environments that are being revealed and clarified by epidemiologic research (15).

The epidemiologic method has two primary uses in cancer: the first is to define and to measure the occurrence and distribution of cancer in populations; the second is to test hypotheses of causation through studies on the interrelationships of various characteristics to cancer. The occupational scrotal cancer, known since 1775, was the forerunner of an impressive list of neoplasms attributable to environmental exposure to carcinogens. Such carcinogens are not limited to exotic industries, but exist in the air we breathe, the water we drink, the food we eat, and some habits we cherish.

After a long period of relative quiescence, we are seeing a resurgence of epidemiologic studies on cancer. In this our British colleagues, Bradford Hill, Percy Stocks, and the late Ernest Kennaway have had preeminent roles.

Epizootology, the systematic study of the occurrence of neoplasms in animals, deserves much more attention than it is receiving at present. Almost 100 million cattle and other stock animals are slaughtered in this country every year. A steady rise of leukemia in cattle has become a problem of importance in Europe (16). Neoplastic diseases, particularly leukosis, cause one-third of the mortality among pullets and hens (17). Recently the northwestern fisheries became aware of a marked increase in the occurrence of hepatoma among older rainbow trout (18), a finding previously reported from northern Italy (19). Dogs and cats, domestic animals of closest proximity to man, develop many neoplasms. But our knowledge of neoplastic diseases among such animals is limited to anecdotal descriptions of sporadic cases. Unless we assume that man and his animal relatives inhabit unrelated universes, it is high time to begin the examination of the neoplastic interrelationships that must exist between different species and the environments they share. The name for this

approach is ecology, which encompasses epidemiology, endemiology, and epizootology. The basic material for its studies is a defined population in a defined geographic environment; the basic methods are long-term observations and statistical analysis. In heart disease, Framingham, Mass., and in sociology, "Middletown," are the early prototypes; in cancer, Hagerstown in Maryland (20), Alameda County in California, and Erie County in New York may become as well known as some of our renowned laboratories and clinics.

It is my conviction that the development of the ecology of cancer to full stature should form the next large programmatic support area in cancer research.

Some Clinical Aspects

An important development in cancer research during the past few years has been the increasingly fuller participation of clinical investigations, so that now these represent more equal partnerships with the laboratory sciences. One of the many yields of this reorientation of approaches is that less is heard about the sterile semantic distinctions between fundamental and applied research. For indeed, investigations on man can be as fundamental as investigations on fruit flies; and from another viewpoint, all research on cancer is applied research by definition.

The rise of clinical investigations is attributable to several factors, not the least important being the financial support that now allows these expensive studies. However, the predominant reason is the acceptance by clinicians of rigorous scientific methods to a degree that was almost unthinkable only a decade ago (21). The statistical methods developed by Fisher, Gaddum, and others which converted agricultural and pharmacological research from a trial-and-error collection of impressions to exact experimental sciences now also form the requirements for clinical studies. We have learned of the need for unequivocal definitions and criteria and for meticulous experimental design; of the requirement of randomized controls and of the innumerable sources of bias that can be avoided by double-blind techniques; of the placebo effect, to which the investigator

is as liable as the subject; of the economy and safety contributed by sequential procedures; and of the biometrician who questions our plans, makes impossible demands, and finally doubts our interpretation of the results (22).

In these new frontiers of science, cancer research has played a significant part, especially in the field of experimental chemotherapy of cancer. This search has now been organized into a national commitment and an international effort of a scope and complexity for which it is difficult to find a parallel in the biomedical sciences (23). Among the many pioneers and leaders in the endeavor, the names of Sidney Farber, Alexander Haddow, Charles Huggins, and the late Cornelius Rhoads tower above the rest.

It should be emphasized that the national cancer chemotherapy program has in no way replaced or reduced other approaches in cancer research; in many instances, it has nurtured and supported them. Also, placing the chemotherapy program in the clinical section of this paper merely recognizes its direct clinical aim, which is but the last phase of investigations that have their roots in chemistry and pharmacology.

The number of chemicals and crude products that have been tested on mice and other animals bearing transplanted tumors now approaches 100,000, and over 100 materials have received clinical attention. The collected progress reports from the 150 collaborating institutions engaged in this aspect of the program have been published recently (24). It is sufficient merely to mention that at least 20 chemical agents already have gained a place in the clinical management of cancer, and in specific types of disseminated neoplastic disease some of these agents produce complete remissions that are maintained for many months. These effects are real but incomplete. Truly effective agents for the treatment of cancer are not to be found among the drugs now available, but await discovery in the future.

An interesting modification of the drug-testing program was the exploration of the use of chemotherapeutic agents as adjuvants to surgical resection performed with curative intent in gastric, rectal, and pulmonary cancer (25). The results are negative insofar as demonstrat-

ing any value of the specific chemotherapeutic addition to the specific neoplastic diseases is concerned. But the yield for the future is far from negative. The studies demonstrated how well a large group of clinicians can work together on problems beyond the capacities of any one investigator. It was demonstrated that potentially hazardous experimental procedures can be undertaken ethically on man, without compromising with scientific criteria. And it was demonstrated that the disciplined group requirements of such studies are entirely compatible with the individualistic private medicine that America espouses.

Another collaborative national effort to pool data for the evaluation of the results of treatment is the End Results Evaluation Program (26), which began at the 1956 National Cancer Conference. Because of this program we now have more reliable information on what happens to cancer patients.

While for the eventual future we are accentuating efforts in chemotherapy, we have to use and to improve the methods we have at hand, surgery and radiation. But even the most universally accepted procedures require periodic reexamination, because only in the treatment of skin cancer do we have any right to be satisfied with our results. Biometrically designed, controlled clinical trials are not limited to the testing of new drugs. Their application to many accepted forms of surgical and radiological treatment of cancer is long overdue.

A case in point is the radical mastectomy. The removal of the breast en bloc with the pectoral muscles and the axillary contents was devised 70 years ago. In almost all surgical centers in the United States, it is the only accepted procedure for cancer of the breast. A decade ago, some heretics began to publish their lack of conviction regarding the assumed benefits of this operation. Park and Lees (27), by deductive logic, and McWhirter (28), by canny Scottish empiricism, described their doubts in persuasive papers that could not be ignored. The emotional reaction that was aroused was not followed by a calm appraisal and recourse to scientific inquiry.

The table is a compilation of 5-year survival figures gathered by Deaton (29), to which has been added a series recently reported by Smith

and Meyer (30). These crude data allow no conclusion that simple mastectomy, with or without radiation, is or is not superior, inferior, or equal to the classical radical dissection. Unbiased data for acceptable evaluation simply do not exist. But the figures do suggest that such an evaluation would be useful. If the simple mastectomy yields all the benefits to be expected from the more hazardous, more deforming, and more crippling radical operation, or if the additional trauma of radiation does not improve the outcome, what medical, economic, or ethical justification is there to continue our traditional policies?

Two years ago the National Advisory Cancer Council recommended a rigidly controlled clinical trial of the radical mastectomy compared with the simple mastectomy, plus radiation and other ancillary procedures. The recommendation has not been accepted by our surgical organizations, and without such sponsorship a national study is impossible, if only for medicolegal reasons.

Breast cancer is the most common single neoplastic entity in the United States; more than 50,000 new cases are diagnosed annually, and of these more than 25,000 would be considered operable. But a small fraction of cases diagnosed during one year would be sufficient to mount a clinical trial that would allow us to replace clinical impressions with solid facts.

We are emerging from a period during which supraradical operations were being applied to a variety of neoplastic diseases. The acceptance of clinical chemotherapy is a manifestation of the disappointments of these heroic measures. It is now timely to reexamine not only the radical mastectomy for breast cancer, but also the pneumonectomy for lung cancer, the en bloc skin and lymph node excisions for

melanoma, prophylactic neck dissections, and many other cherished techniques. It is time to recognize that without the test of a designed clinical trial the old dictum, "the smaller the cancer the larger the operation," may be an exercise in circular thinking.

There are also neoplastic diseases in which our usual therapeutic attack may not be sufficiently aggressive. The results in Hodgkin's disease reported by Vera Peters (31), for example, deserve wider study, and indicate that small doses of irradiation and alkylating agents are as contraindicated for clinically localized Hodgkin's disease as they would be for any other clinically localized cancer. Bloedorn's observations on radical preoperative radiation in lung cancer (32) also deserve further study.

Some Social Aspects

Laboratory research on cancer is sterile unless eventually some of its results can be applied to man. Clinical research also has not been fully developed until its fruits are applied to the whole population. In turn, these applications generate problems that need to be brought back to the laboratories and clinics. Furthermore, problems of public health, sociology, and economics are as relevant to some aspects of cancer as the chromosomal structure of neoplastic cells, and are equally demanding of the use of the scientific method.

Cancer research has made a number of advances for which the dramatic word "breakthrough" is entirely appropriate. But a breakthrough is only potential unless it is exploited. There are two such areas in which significant results in the control of cancer could be achieved if our knowledge were more fully utilized.

The first breakthrough is in vaginal cytology. It is now over two decades since Papanicolaou placed in our hands a method of detecting cancer of the uterine cervix at the preinvasive stage, when it is entirely curable. The importance of cytology is not as a diagnostic aid but as a detection method, by means of which preinvasive cancer is discovered well in advance of clinical symptoms or signs. Its full potential is reached only if it is used as a screening method on large populations.

Five-year survival rate for patients with breast cancer following radical and simple mastectomy

Type of mastectomy	Series of patients	Number receiving operation	Percent surviving
Radical.....	11	3, 279	54
Simple.....	7	905	59

SOURCE: Deaton (32) and Smith and Meyer (33).

Figure 3. Frequency of intraepithelial and invasive carcinoma of the uterine cervix in two successive screenings: combined data from Memphis, Madison, and San Diego

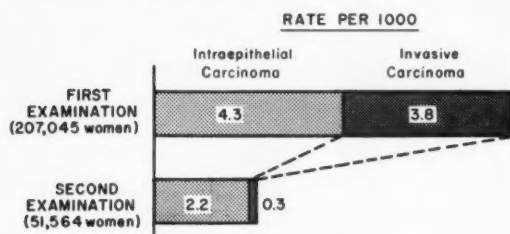


Figure 3 shows what happened in three populations, Memphis, Madison, and San Diego, where 200,000 women were examined (33). The preinvasive lesion was found in 4.3 women per 1,000, and in 3.8 women per 1,000 an invasive cancer was found, usually symptomless and unsuspected. When a portion of these women were reexamined 1 to 2 years later, the frequency of the preinvasive lesion was reduced by half, to 2.2 per 1,000; these presumably are new lesions that arose during the period between examinations. The important finding, however, was that invasive cancer dropped to 0.3 per 1,000 or to one-tenth of the frequency at the first examination. The inference is inescapable that a substantial proportion of the mortality from cervical cancer could be eliminated if the cytological test were available and were performed annually on all women, and if appropriate therapy were instituted. This neoplastic entity now accounts for some 10,000 deaths per year.

But how many women actually undergo this examination regularly? What logistic planning is going on to create the necessary facilities? What public health education is being organized to teach women that a cytology test is as important as a permanent? The size of the problem of screening 30 to 50 million slides per year indicates that mechanical means of analysis, such as the cytoanalyzer, must be developed, and that self-obtained smears (34) that could be sent through the mails must be accepted as a collection method supplemental to specimens obtained in doctors' offices.

No cytoanalyzers will be made until there is

a demand for them, and communitywide cancer cytology centers will not become universal until physicians take an active lead. The experience in San Diego (35) demonstrates that this can be done with the control and management being retained by private physicians. Once again we have evidence that public health and preventive medicine are entirely compatible with private medical practice, but the "block and don't tackle" tactic as an answer to medical and public health problems is compatible with neither.

The findings in cervical cancer have a more general implication, as a demonstration that curable cancer is symptomless cancer. The experience of the University of Minnesota Cancer Detection Center with 9,000 persons examined since 1948, as recently reported by Sullivan (36), forcibly reiterates the lessons Elise l'Esperance tried to teach us years ago. An increasing number of industries have accepted the fact that periodic examinations of their executives are a good investment. It is just as good an investment for everyone else. Again, the logistics of the situation simply are not met by the wishful slogan, "Every doctor's office a detection center." Physicians must meet the need, through voluntary action at the community level.

The second unexploited breakthrough in cancer research is the establishment of the fact that tobacco smoking causes a significant proportion of malignant neoplasms of the lung, larynx, and oral cavity.

Figure 4 presents data of the classic Hammond and Horn (37) study on the relationship of smoking to mortality among 180,000 men. It is taken from a recent paper by Joseph Berkson (38) that forms a part of a valuable Mayo Clinic symposium on the effects of tobacco smoking in man. His interpretations of the findings, however, are somewhat at a variance with mine. The many statistical investigations, all coming to the conclusion that smoking and lung cancer are associated, the extensive laboratory experiments that establish the presence in tobacco smoke of at least 10 chemicals with carcinogenic activity in animals, the careful pathological observations of human material, and the pathophysiological studies on the effect of tobacco smoke on the bronchial epithe-

lium have been thoroughly reviewed and analyzed by many national and international committees (39).

It all adds up to this: If tobacco smoking, at least in the form of cigarettes, were terminated, the annual mortality from lung cancer could be reduced by more than 60 percent, a saving of at least 20,000 lives in the United States alone.

Tobacco is considered neither a food nor a drug, and it appears to be immune from all regulations except taxation. Therefore, apparently more can be done to protect the population from rat goiterogens in berries and from hepatomas in fish, where the dangers for man are at most theoretical, than from a product with demonstrably deleterious effects for man. Accepting the theory that it is a constitutional right to choose one's poison, does this right extend to children?

Figure 5, taken from a recent analysis by Lombard and Snegireff (40), shows that the earlier smoking is begun, the higher the eventual prevalence of lung cancer. The facts recorded here cannot be ignored.

The problem is immense, with social and economic ramifications that require the judicious consideration of many elements of society in addition to the medical profession. But first it requires that physicians and scientists concerned with health recognize that smoking is a serious public health problem. Our con-

Figure 4. Age-adjusted death rates for various disease groups in relation to amount of smoking

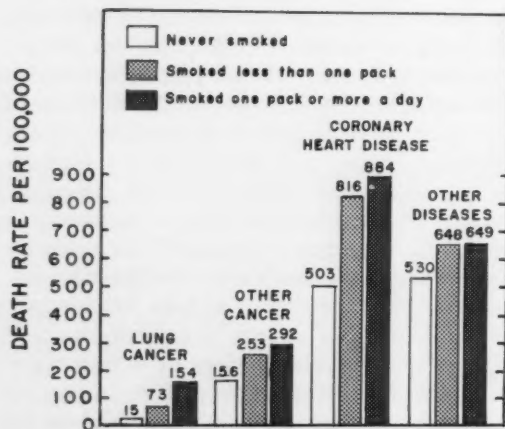
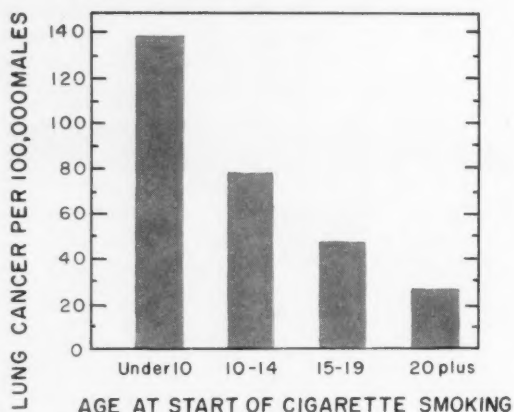


Figure 5. Prevalence of lung cancer per 100,000 males in relation to age at which cigarette smoking was started



victions are known by our actions: not smoking in public and before youngsters and prohibiting smoking in hospitals and clinics, including doctors' lounges, may be powerful medicine.

Last, but certainly not least, mention should be made of the change in the attitude of physicians toward patients with cancer that is beyond surgical or radiological intervention. During the preantibiotic days, clinicians who made detailed daily notes on patients with subacute bacterial endocarditis or tuberculous meningitis, then rapidly and universally fatal, had little interest in patients with recurrent neoplastic disease. Now the course of patients with progressive cancer is of increasing clinical interest. This is of definite benefit to both the patient and the physicians. It is also an effective preventive to the despairing recourse to charlatanism.

The social and economic problems of cancer patients, however, have remained much the same. Two-thirds of all patients diagnosed as having cancer die of or with their disease, after long, expensive treatments that debilitate the purses and the hearts of their families. The lingering death of a cancer patient at home leaves unhealing psychological wounds. The topic of terminal care is important but unglamorous and requires more attention than it receives.

One approach that would help to alleviate the inevitable problem of the care of patients with

terminal cancer is the greater use of such patients in research. Perhaps this would also hasten the fulfillment of the promise made by that time-tested prophet H. G. Wells (41) in 1927: "The disease of cancer will be banished from life by calm, unhurrying, persistent men and women, working with every shiver of feeling controlled and suppressed, in hospitals and laboratories, and the motive that will conquer cancer will not be pity nor horror; it will be curiosity to know how and why."

Our present concepts concerning cancer must remain fluid, susceptible to responsive modification on the basis of new information. Cancer research has no place for fixed concepts, for vested interests, for orthodoxy. But we can stand firm on this: cancer is a solvable problem, within the capabilities of human intelligence using a human thought and action process we call scientific research.

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Hospitals for Indians

A new 38-bed hospital at Keams Canyon, Ariz., and a 50-bed hospital at Kotzebue, Alaska, have recently been completed as part of the Public Health Service's Indian health program.

The Keams Canyon hospital replaces an outmoded facility on the Hopi Reservation and will serve patients from both the Hopi and Navajo tribes. The Kotzebue hospital, which replaces a 15-bed non-fireproof unit built in 1930 and a 24-bed quonset hut, will serve more than 7,500 Alaska natives, mostly Eskimos.

In South Dakota, the Rosebud and Pine Ridge hospitals serving the Sioux have been modernized and enlarged.

Since 1955, when the Public Health Service was given responsibility for the program, 5 new hospitals and 15 field health centers have been constructed, and 10 hospitals have been modernized and enlarged.

Preventive, curative, and rehabilitative services are provided by the 52 Indian hospitals, 22 health centers, 18 school health centers, and several hundred health stations on the reservations. In 1960, admissions to the Indian hospitals totaled 56,900, and 900,000 outpatient visits were made to all Indian facilities.

Tuberculosis Casefinding, 1961

EDWARD T. BLOMQUIST, M.D.

LONG AGO we accepted the idea that tuberculosis casefinding would become more difficult when there were fewer cases to be found. What the greater difficulty would be, however, did not get much attention. If we thought about it at all, probably most of us assumed that we would simply have to work harder at what we were already doing, which was getting as many people X-rayed as we possibly could—and if they were X-rayed every year, so much the better.

Then, 6 or 7 years ago, it began to be apparent that programs trying to X-ray whole communities were finding fewer and fewer cases. Recommendations began to be made, by the Public Health Service and others, for focusing tuberculosis casefinding attention on the parts of the population in which the incidence of tuberculosis was known to be, or could reasonably be expected to be, higher than average. The object of casefinding surveys, it was pointed out, was to find cases. Tuberculosis control facilities were limited. Therefore, when cases were not being found, programs would need to be cut down or redirected, if they were really to contribute to hastening the downward trend of tuberculosis rates.

This suggestion was received with little enthusiasm, partly, I believe, because many workers in tuberculosis control were sincerely convinced that the more chest X-rays taken the better and that any cutback would surely be quitting too soon. They were committed to the idea that all cases of tuberculosis should be discovered through organized casefinding,

even though casefinding activities had never actually found all the cases in any sizable area. It was truly impossible for them to believe that they could do better casefinding if they took fewer X-rays. Furthermore, a great deal of effort had been put into education campaigns promoting annual chest X-rays for all adults.

How could one retreat from that position? The embarrassment of such retreat was perhaps more acute because usually the very parts of the population which had come to accept the virtues of annual X-rays—the most “reachable” part—were those with the lowest yield from X-ray surveys. These people probably would be the least likely candidates for survey if the recommendations were followed, and yet, if there was a demand for chest X-rays, it was from this group. It is not surprising, therefore, that relatively little change came about, and that chest X-ray buses continued to do business at suburban shopping centers.

Then, in 1957, the Public Health Service added to its recommendation for selective chest X-ray casefinding a caution about the importance of using X-ray judiciously, weighing the potential benefits against the potential radiation hazard. The statement issued at that time gave examples of the populations which might be considered “high prevalence” groups, pointed out the importance of complete follow-up, and suggested consideration of tuberculin testing as a first step, with X-ray only for reactors, in low-prevalence groups.

The 1957 statement on X-ray casefinding also emphasized the need for proper use of X-ray machinery and careful monitoring to reduce unnecessary radiation exposure. On this point, the statement had a very desirable

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result; in most parts of the country the safety of photofluorographic equipment has been improved.

Otherwise, however, many interpretations of the 1957 statement added to the confusion about tuberculosis casefinding. In spite of its flat declaration that "mass radiography of the chest, operated under competent auspices, is a fundamental technique in tuberculosis control," the statement was interpreted by many to have sounded a great alarm about the danger of chest X-rays and was reported in the press in some areas as almost a ban on chest X-rays. After the first furor had settled down, we were chagrined to hear that many people understood that the Public Health Service's major recommendation in tuberculosis casefinding was tuberculin testing in low-prevalence areas. We even heard that we were recommending "substituting" the tuberculin test for the chest X-ray. By then it was too late to go back and add "when communities are in a position to do tuberculosis casefinding in low-prevalence groups" to the recommendation that "consideration should be given to the tuberculin test as an initial screening device in low-prevalence groups." It was too late, also, to italicize "initial" in that sentence or otherwise emphasize the need for X-ray of reactors.

In the past few years, mass tuberculin testing programs have been undertaken in many communities and have to a great extent replaced, in expenditure of casefinding effort, "community-wide" chest X-ray surveys. The majority of these programs are done in schools, where the problem of the 2-day lapse between testing and reading is minimal. Since children aged 5-14 years have the lowest rates of tuberculosis, it is a little hard to understand the enthusiasm for testing of school children—all school children, every year—that one encounters in many areas. The fact that no cases are being found in many such programs does not discourage some enthusiasts. They are no more receptive to the idea of selective school tuberculin testing than the advocates of communitywide chest X-ray surveys were receptive to the idea of selective X-ray casefinding.

In some school programs, little or no effort is made to have reactors X-rayed, and in many the possibility of finding cases by examining

family associates of young reactors is disregarded. The rationale behind these activities seems to be that they provide a means to observe trends in infection rates. This is no doubt true, but selective tuberculin testing at intervals of 3 to 5 years would accomplish the same end, and perhaps could free personnel for other work that might actually affect the trends. Observing trends, important as it is, does not interfere with the spread of infection and therefore cannot in itself have any effect on trends.

We in the Public Health Service again find ourselves in the position of questioning the wisdom of a casefinding procedure that is widely accepted. While it is impossible for us to draw a universally applicable blueprint for tuberculosis screening activities, it seems important to state some positive principles for consideration in planning casefinding programs.

Part of Total Tuberculosis Control

To begin with, it seems to me that efficient and effective tuberculosis casefinding must be a part of a total tuberculosis control program. Often, I have observed, casefinding is treated as though it were entirely independent of services to known patients or even, amazingly, entirely separate from examination of contacts of known cases. (As a matter of fact, contact examination is often not considered casefinding.) This is an artificial separation, if only because effective casefinding calls for the same kind of professional skills and the same kind of facilities as other tuberculosis control activities. Services to known patients and their contacts require the attention of physicians and nurses, and X-ray and laboratory work. So does casefinding, if it includes the followup without which cases will not be found. Often the same people on the health department staff do both. If their time is already fully occupied with services to patients and their families, a casefinding program may demand time they do not have. Then either patients and contacts will be neglected or casefinding followup will not be done.

The obvious solution is planning all casefinding programs as a part of the total tuberculosis control program, so that staff time will be available for followup. Since in many areas the tuberculosis association undertakes at least

the first step in casefinding, the health department may have to make a special effort to interpret to the voluntary agency the effect of unexpected followup work on the total tuberculosis control program, and solicit coordination of plans. Perhaps, in some instances, the department may have to resist pressure to undertake or participate in casefinding projects until they can be done properly and without jeopardizing other important activities.

This is not a negative position but a positive one, based on a firm intention to control tuberculosis. It can help to insure good quality in all tuberculosis control activities, including casefinding. Often, I believe, the dissatisfaction of health departments and tuberculosis associations with each other—the feeling of the association that the health department is not fulfilling its casefinding obligations and that of the health department that the association is nagging it to do more than can reasonably be expected—can be attributed to failure to discuss and explain the whole tuberculosis control program. One of the most useful effects of the Arden House Conference on Tuberculosis can be observed in communities in which, to follow through on conference recommendations, health departments and tuberculosis associations have sat down together to assess their total tuberculosis control situation. When it is quite clear to all that there are in the community so many known patients with active tuberculosis who need services, so many contacts who should be examined and suspects whose condition has not been fully assessed, and on the other hand, only so many physicians, nurses, laboratory workers, and other staff to perform these services (and usually services in other aspects of public health as well), it is easier to plan casefinding that can be undertaken with reasonable expectation of doing it well. I believe this is true whether casefinding is to be done by the health department, the tuberculosis association, or the two jointly.

Quality in Casefinding

The second principle I should like to bring up is the principle of excellence. Whatever casefinding projects are undertaken should be done as well as they possibly can be done. This ex-

cellence, it seems to me, must include the thoroughness and promptness implied in the standards recommended by the ad hoc Committee on Goals and Standards in Tuberculosis Control and in the evaluation indexes suggested by the ad hoc Committee on Evaluation of Case Detection Programs. But if high standards are to be reached, judgment and imagination are required, for which standards cannot be set and which no index can measure. However, the measureable results of programs founded upon good judgment and creative thinking will reflect these qualities.

Perhaps some examples will illustrate what I have in mind. Contact examination is carried on by every tuberculosis control program, and yet it is a procedure for which complete and rigid rules are singularly difficult to define. Success cannot be measured in terms of the number of contacts per patient, since a great many contacts could be examined and still those at greatest risk could be missed. Furthermore, generalization is difficult in defining contacts. Suppose that the definition were restricted to persons living in the same household as the patient. This would include a roomer who worked all day and did not eat with the family or socialize with them, but it would exclude a steady boy friend of a young woman patient. The procedure, therefore, must begin with a careful interview of the patient. The interview must be based on knowledge of how tuberculosis is transmitted and conducted with tact and understanding that will not put the patient on the defensive but will encourage his cooperation in deciding who his close contacts are. (One would hope, for instance, that an interviewer would not startle a young woman with the direct question, "Do you have a boy friend?") From our experience and observation, we are convinced that most tuberculosis patients have deep concern about their contacts.

Arrangements for examining contacts have to be made with a sense of concern and urgency, but without creating undue alarm or any threat of punishment. More people will respond if they are given a definite appointment as promptly as possible, but at their convenience, than if a more casual arrangement is made which allows them to conclude that the examination is not important enough to be worth

the inconvenience. As time elapses, persuasion becomes more difficult.

Behind good practice in contact followup, of course, are operations that make definite and prompt appointments possible and administrative decisions that encourage the exercise of professional judgment. However, the extra quality of excellence depends upon the thoughtfulness and affirmative attitude of all the staff.

The same high quality is needed for all case-finding work, of course. Consider the X-ray survey of a high-prevalence population, for instance, and suppose that this population has been carefully defined, on the basis of reported morbidity, as the residents of a particular square mile in a big city slum. All appropriate techniques are applied to mobilize the community, including door-to-door canvassing before the X-ray bus moves around in the area on schedule. And then, when the survey is over, the discouraging fact comes to light that it reached a pitifully low proportion of the high-prevalence group toward which the project was aimed.

At this point, a high-quality program does not falter or give up. The next step, I think, would be a careful review of what had been done to encourage people to be X-rayed in order to find out whether the approach had fitted the population, whether the natural leaders in the community had been brought in, whether hours of operation had been convenient and the locations the best. Then consideration should be given to other ways of reaching this population. If a public hospital or outpatient clinic in the area is generally used by many of the people, a truly thorough admissions X-ray program might find a high proportion of the unknown cases. Perhaps, if there is enough staff time for the purpose, the definition of contacts of new cases in this particular area could be broadened to include a larger number of persons associated with each patient. Tuberculin testing of children who enter school in this neighborhood and of children seen in well-child clinics or conferences, and followup of the families and other close associates of the reactors, would no doubt help. In some areas welfare recipients are receiving chest X-rays, and this might be considered.

Excellence in tuberculosis casefinding today

requires adaptation of methods to fit particular situations. Many of the tried and true methods of previous times no longer fit present situations, and innovation may often be a necessary part of conscientious professional skill. The examples given have been concerned with first steps, but the principle applies all the way through to final diagnosis and to arrangements for treatment.

Realistic Planning

From the days of the first "Early Discovery—Early Recovery" campaigns in the 1920's, the idea that all cases of tuberculosis should be discovered by some means of organized case-finding has been commonly accepted by tuberculosis control workers. It seems time to recognize, however, that this idea is inconsistent with the idea that casefinding projects should have a high yield. Obviously, if casefinding is done only where the yield is high, some cases occurring in low-incidence areas or populations will not be found by casefinding but will turn up when people present themselves to a clinic or physician because they have symptoms or when a physician suspects tuberculosis when he sees a patient for some other ailment. Most communities are therefore faced with the dilemma: Should casefinding efforts be concentrated in the high-incidence groups and the rest of the community ignored? Or should attempts be made to cover the whole community, even though this means that high-incidence groups get meager attention?

Most public health people would choose the first alternative and concentrate on high-yield casefinding, with the thought that such efforts can have a greater total impact on the problem. However, the conscience of those who truly believe that all cases should be found before they find themselves deserves thoughtful attention.

The most realistic way of looking for an answer to the question of what casefinding should be done in low-incidence populations, it seems to me, begins with recognition that the day will come when the incidence in all or most of the country will have reached so low a level that specific tuberculosis control programs will no longer be justified in relation to the total public health needs of communities. A few communi-

ties may already have reached that point, and as others approach it, larger segments of their populations will fall into the low-incidence group. Since it is unreasonable to think that communities will continue to support special tuberculosis casefinding projects until the last case is found, perhaps the present situation should be looked upon as an opportunity to see how successfully areas of low incidence can incorporate tuberculosis casefinding in other programs that can be expected to endure.

First we should consider the facilities and services that are necessary now and that will continue to be necessary as long as there is any tuberculosis at all. All communities need to have a place where people can go on their own initiative or on referral by their physicians, to have chest X-rays and tuberculin tests. In a low-incidence area or in a small community, this may be a local general hospital or general outpatient clinic or a particular physician's office. But it should be known in the community, and should be available to all. In areas of higher incidence or of greater density of population, this service may now be specialized for tuberculosis only.

The second service that can be expected to continue is examination of contacts of new cases and of family associates of young children who react to tuberculin. All health departments carry on this type of epidemiologic work as part of communicable disease control, and in the future, as the infected proportion of our population becomes smaller, it may be the only casefinding that is necessary. Today, followup of contacts is essential in both the low-incidence parts of communities and in the real strongholds of tuberculosis.

Other than these two services, tuberculosis casefinding in low-incidence areas must increasingly become a part of routine examinations for other purposes. One possibility, of course, is the examination in the physician's office. Although relatively few people have regular physical examinations, the availability of a place to which physicians can refer patients for tuberculosis screening tests may help to encourage periodic referral of patients seen for other purposes.

Employee health programs are another possibility, although only about 30 percent of

employed workers are in establishments with such programs. In low-incidence areas, I think we must begin to discard the concept that chest X-ray (or tuberculin testing) surveys should be conducted annually in industries. Instead, I think it more sensible to do one survey, a tuberculin test for all employees and X-ray of reactors, and after that tests for new employees when they are hired and periodic X-rays for employees who are reactors, especially those in high-risk age groups. In large plants and organizations with complete employee health services, these procedures could be a part of the routine. For smaller groups of employees, referrals could be made to the screening facility.

In schools, colleges, and other institutions in low-incidence areas, a tuberculin test could be part of entrance health examinations. It should be kept in mind, however, that in communities where health department staff must do whatever tuberculin testing is done in the schools, any extensive school testing must be planned in terms of other tuberculosis control and general health program activities. As a matter of fact, all of these activities for which the health department must take on followup responsibility should be planned as a part of the total program.

Realistic planning does not necessarily mean abandoning all tuberculosis casefinding in low-incidence populations, but it does mean abandoning the "everybody every year" concept that was appropriate when tuberculosis could be found at significant levels in all segments of the population. Those who defend broad-scale low-yield casefinding because of its "educational value" should consider also the evidence that some persons who are subjected to or who observe repeated screening programs in which no one is found to have disease are becoming disillusioned with the "educational" message, and are therefore not only unwilling to participate, but disinclined to support tuberculosis control activities that are necessary to protect the public health.

Consideration of People

In a previous paper (*1*), the statement was made that "Chemotherapy applied as a public

health measure requires a system of providing services in a way that does not place the patient on one side and the community on the other." The same general idea applies in casefinding activities, which should not place the people we want to screen on one side and the community, as represented by the health department or the tuberculosis association, on the other. To keep them on our side requires telling the truth, without either exaggerating risk (Everyone is in danger of tuberculosis) or promising exemption (Have a chest X-ray to make sure you don't have TB). It seems worth mentioning, incidentally, that when a community's provisions for treating tuberculosis patients are of good quality, that community can truthfully be more optimistic in its casefinding messages.

The people we want to reach in casefinding do not have the concern about tuberculosis that we have. There is no reason to think they are difficult or unintelligent if they do not put themselves out to be screened. When the manner in which casefinding is conducted conveys clearly the idea that the workers who are carrying it out think it is important, this idea is communicated to the public. For instance, when notifications about results of chest X-rays are sent out promptly, the procedure seems a great deal more important than when weeks or months go by without any word. Screening operations carried on in evening hours not only make participation more convenient for people who work during the day, but are worth many words in declaring that the sponsors of the operation think these people should be screened. Specific clinic appointments for contacts or for followup of screening suspects have the same effect; so

does time taken to explain procedures and to make sure the explanation is understood.

As the patterns of tuberculosis in communities become more spotty, the mass appeal has less usefulness, and individual encounters become more important. Our experience in the Public Health Service prophylaxis trials has been that most people will take pills every day for a year if they are made to feel that somebody thinks it is important that they do so. I believe the same thing applies in many areas of casefinding.

Summary

Tuberculosis casefinding is certainly more difficult now than it used to be. Because it is and because we have to work harder to find every case, we must tighten up activities so that every effort counts. To summarize, I think first that casefinding must be considered, and must actually be, a part of a total tuberculosis control program, and not separate from other activities. It must have high quality, resulting from thoughtful application of the best skill of everyone involved. It must be realistic in terms of the size of the problem, so that we will not suddenly find ground lost because we have refused to change our ways. It must be done for people, not to them, and in a spirit of concern and sympathy.

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Damaged on Arrival

Please advise *Public Health Reports* when copies fail to arrive clean and whole. We shall be glad to replace damaged copies. Since a protective wrapper for mailing would add considerably to the expense of distribution, we plan to continue to mail the journal open unless the incidence of damage justifies a change. Epidemiologically speaking, preventive action does not seem warranted by the data available.

Residency Training in PHS Hospitals

Frank S. French, M.D.

MODERN PATTERNS of medical education in this country had their inception in the celebrated Flexner Report prepared for the Carnegie Foundation for the Advancement of Teaching in 1910. This epochal report by Dr. Abraham Flexner resulted in the closing of less competent medical schools, including those operated solely for profit.

Since then, medical schools have been brought largely under the control of universities, clinical laboratories have been incorporated into the medical schools, and curriculums have been firmly established. Research laboratories in the basic medical sciences began their growth into the empires of the late twenties and thirties. From these, true graduate education programs in the basic medical sciences sprang up to produce teachers of outstanding competence, and from these teachers there emerged a flow of new medical knowledge which has since become a veritable outpouring.

The situation of 50 years ago is now reversed. Then, wide application was given to limited medical knowledge; today, there is limited application of extensive learning.

Within the past 10 years, most medical schools in this country have been forced to abandon the teaching of more and more of the details of medical knowledge. Medical students must now rely to a greater extent than ever before upon internship and residency to supply these details.

Formerly, hospitals were responsible primarily for clinical training and experience in

the internships and residencies they provided. They now must teach the details of basic and clinical sciences to make up for undergraduate deficits. The teaching of these details and the integration of the basic medical sciences (anatomy, pathology, biochemistry, physiology, pharmacology, and microbiology) into a working human biology which is correlated with clinical syndromes are too often neglected in the routine of patient care.

The residency training programs of the Public Health Service were set up in the first few years after the Second World War, except the residency in psychiatry established in 1938 at the Lexington, Ky., hospital. Expansion of Public Health Service residency training began in answer to the need for specialty training for returning military medical personnel. Residency programs are now an established part of our hospital system; they are the Service's principal source of trained clinicians; they serve as the channels through which new medical knowledge, diagnostic and curative, is brought to the bedside, the laboratory, and the operating room. The programs provide incentive for study, inquiry, and research; they provide the intellectual stimulation essential to the maintenance of high clinical standards. The principal concern of a hospital is, of course, patient care, but in this day of discovery, the routines of patient care are strongly tied to education and research.

Only a professional teacher can readily translate the language of research laboratories, full of the terms of higher mathematics, inorganic chemistry, biology, and physics, into language understandable to the ordinary medical student or physician. New medical knowledge as it appears in much professional literature is incomprehensible to the undergraduate, graduate,

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or practicing physician. Thus teaching hospitals must depend more and more upon staffs of medical schools to translate this knowledge and select the more valuable contributions from the great mass of published material.

It is therefore inevitable that Public Health Service hospitals should be drawn more closely to the medical schools. Just what form the arrangements should take is difficult to say at this point. Certainly, there will have to be some "give and take" on both sides. The degree of "give" by the medical schools will bear some relationship, of course, to the contributions to their programs made by our hospitals. The balance will probably be in our favor—professional teachers are notoriously generous. We need to look seriously, however, to our ability to contribute something of worth to the objectives of the medical schools. In this regard, we may look upon our patients as a valuable study source. We may also need to lengthen the

periods of assignment of our senior staff members in order to assure greater continuity and stability in our participation.

Exactly what part research will take in our residency training programs is difficult to predict, but we well recognize that research as a teaching tool has become established in this country. Francis E. Gray, chairman of the board of trustees of Massachusetts General Hospital, has said that the period of 1935 to 1955 "saw the trinity of the care of the sick, teaching, and research unite for the good of mankind as never before in the history of the hospital." We are all agreed, I believe, that opportunities for research should be available. On the other hand, we would probably be loathe to require research work of anyone. We would hope rather that our hospitals would be so charged with an atmosphere of inquiry as to nurture the highest possible accomplishments on the part of our residents.

Poison Control Centers

The number of poison control centers affiliated with the National Clearinghouse for Poison Control Centers rose to a new high of 460 as of July 1, 1961. There are now centers in all the States except Vermont and Montana, and in the District of Columbia, Panama Canal Zone, Virgin Islands, and Guam.

The National Clearinghouse, directed by the Public Health Service's Division of Accident Prevention, provides local centers with information on ingredients and antidotes for new products. More than 200 major manufacturers of drugs and household products supply the data. The centers make this information available to physicians by telephone, day or night. Parents who call the centers are given first-aid instructions and are advised to call their doctor.

The Hazardous Substances Labeling Act, enacted by Congress in 1960 and administered

by the Food and Drug Administration, requires that labels on household chemical products include the identity of hazardous ingredients, antidotes for toxic substances, and warnings and precautions needed for safe use. The law is now fully enforceable for highly toxic and flammable substances. Labeling requirements for other hazardous articles become effective on February 1, 1962.

While the labels should facilitate the work of the poison control centers by providing safety information, medical consultant services will still be needed, Henry L. Verhulst, director of the National Clearinghouse for Poison Control Centers, points out. Consumers may disregard label information or leave hazardous substances within reach of small children, he said. Each year an estimated 600,000 children swallow household aids left within their reach and about 500 die.

Staphylococcal Infection in Meat Animals and Meat Workers

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ALTHOUGH most of the serious and fatal cases of staphylococcal disease in Seattle and King County, Wash., occur among hospitalized patients suffering from other diseases (1-5), several recent incidents suggested that the community has nonhospital reservoirs of staphylococcal infection which may be important in the ecology of staphylococci.

One such incident was an outbreak of boils (pyoderma) among workers in a poultry-processing establishment in Seattle. An investigation in October 1956 revealed that from May through September of that year 19 (63 percent) of the 30 poultry handlers in the establishment developed boils and other suppurative skin lesions. Most of the afflicted workers missed a few days from work, and several more than a week. Cultures prepared from specimens obtained from three patients with active lesions yielded coagulase-positive *Staphylococcus aureus*, bacteriophage type 52/42B/81 (now known as type 80/81).

Investigation of possible epidemiogenic factors revealed that this poultry plant began us-

ing an Acronizing process (chlortetracycline HCl) about May 15, 1956. The antibiotic replaced chlorine in the ice water bath in which the chickens were immersed for 4-6 hours after they were killed, cleaned, and eviscerated. It was claimed that the Acronizing process extended the "shelf life" of the poultry, permitting the holding of chickens at ordinary refrigerator temperature for as long as 14 days. Most of the workers, however, had little if any direct contact with the Acronizing process.

Investigation of the outbreak also revealed that abscesses, especially along the keel bone, were sometimes observed in chickens. The plant manager and sanitary inspector were instructed to submit any abscessed poultry carcasses for culture. One such bird, with an abscess along the keel bone, was submitted and yielded a coagulase-positive *S. aureus*, bacteriophage type 7. Letters were sent to the 21 growers who had supplied poultry to the processing plant during 1956 asking whether they had observed any unusual disease in their flocks and what antibiotics they had used in raising the poultry. Thirteen of the 15 growers who replied stated that they had used tetracycline in raising the chickens sold to this poultry plant. None, however, reported unusual or staphylococcal-like disease among their birds.

Another incident occurred in December 1959. At least 30 members of a carpenters' union became severely ill with staphylococcal food poisoning after eating ham at a union-sponsored dinner. Investigation revealed the following epidemiology: A tinned ham, purchased at a supermarket, was removed from its can, sliced by machine, wrapped in aluminum foil,

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and delivered to a woman who assisted with preparation of the meal. She baked the sliced ham, still wrapped in foil, for about 2½ hours at 300° F. and then left it at room temperature until it was served the following day. Coagulase-positive staphylococci, bacteriophage type 6/7/47/54/70/73/75, were isolated from (a) the remnant of canned ham served at the dinner, (b) a throat swab specimen from the cook who prepared (and also ate) the ham, (c) throat swab specimens (obtained after recovery) from two food-poisoning victims, and (d) swab specimens from infected cuts on the hands of two meat cutters in the supermarket, one of whom had sliced the ham. No viable staphylococci were isolated from a canned ham, not previously opened, from the same lot as the one causing food poisoning. On questioning, the meat cutters stated that knife cuts (which they inflict on themselves frequently) had become suppuratively infected about a month before the outbreak occurred. They also said that such infections, which they referred to as "pork infection," occurred most frequently in the spring and fall.

Apparently, the meat cutter inoculated the ham with pathogenic staphylococci while slicing the ham, and leaving the ham at room temperature after it was inadequately cooked permitted great multiplication of the organisms. The findings suggested that meat, particularly pork, might expose meat cutters to an occupational risk of staphylococcal infection of cuts.

A third incident took place in June 1960. At least three persons became severely ill with acute gastroenteritis several hours after eating ham sandwiches in a Seattle restaurant. These persons ate ham which had been cooked by exposure to infrared lamps for at least 18 hours and perhaps as long as 36 hours. The measured temperature of another ham similarly held under the infrared lamps was 112° F.

Laboratory examination of specimens of the implicated ham in this incident showed many gram-positive cocci by direct smear and a bacterial count of approximately 100 million organisms per gram of ham by culture. The only pathogenic organisms identified as part of the heavy bacterial growth were coagulase-positive *S. aureus*, which were not typable by means of bacteriophage. A specimen of an un-

cooked, refrigerated ham from the same restaurant revealed a few mixed, gram-positive bacteria by direct smear and approximately 1,000 organisms per gram of ham by culture. No coagulase-positive staphylococci were isolated from the refrigerated ham initially, but when a portion of the same specimen of ham was incubated at 35° C. for 36 hours it contained a bacterial count of more than 1 billion organisms per gram of ham, including coagulase-positive *S. aureus*, not typable by means of bacteriophage. Specimens of vomitus and stool from one hospitalized diner were examined. No coagulase-positive staphylococci were isolated from the vomitus, but coagulase-positive *S. aureus*, not typable by bacteriophage, was isolated from the stool. Furthermore, the specimens were negative for *Salmonella*, *Shigella*, and pathogenic *Escherichia coli*.

These findings indicated that the raw ham was lightly seeded with a variety of organisms, including pathogenic staphylococci, at the time it was received by the restaurant, and that the incubatory infrared lamps then caused great multiplication of organisms, especially the pathogenic staphylococci which caused the acute gastroenteritis.

These incidents suggested that considerable staphylococcal disease may derive, either directly or indirectly, from nonhuman reservoirs of infection. To explore this possibility, a study of staphylococcal infection in meat animals slaughtered in this community and in persons slaughtering these animals or processing the meat was made in the summer of 1960. The availability of an investigator with both veterinary and medical training (R.C.E.) greatly facilitated the undertaking.

Method of Investigation

The approximate number of meat-handling establishments in Seattle and the number of employees—slaughterers, cutters, boners, wrappers, sausage workers, packagers, and other handlers—was ascertained by means of questionnaires with the assistance of the six meat inspectors employed by the health department. The number of pounds of meat from animals slaughtered in Seattle and King County abattoirs was ascertained from city, State, and

Federal officials who routinely inspect these establishments.

To learn the nature and prevalence of staphylococcal infection among meat animals and meat workers, 15 establishments, including 2 slaughter, 5 wholesale, 3 poultry, and 5 fish establishments, were selected for intensive study. They were chosen because (a) they were located in Seattle, (b) they were among the largest of their respective kinds of establishments (there are only three poultry-processing houses in Seattle), and (c) their managements agreed to cooperate.

For each of 318 (all) workers having direct contact with raw meat in these 15 establishments, histories were obtained by direct personal interview. The histories covered job classification, employment tenure as a meat handler, and experience with boils and "blood poisoning," or "septicemia." The term "septicemia" is used in this article to denote wounds

with associated inflammation, lymphangitis ("streaking"), and fever, necessitating medical treatment and referred to as "blood poisoning," "pork infection," or "fish poisoning" by the workers.

Each employee was also given a dermatological examination. Men were stripped to the waist; for women, the head, neck, and upper extremities were examined. Swab specimens for culture were obtained from any suppurative skin lesions observed and routinely from the nostrils. These specimens were immediately transported to the laboratory of the Seattle-King County Health Department and cultured by standard methods, using Chapman-Stone medium.

Abattoir inspectors were asked to save all suppurative lesions observed in meat and to notify the investigators. These specimens were also immediately taken to the laboratory of the Seattle-King County Health Department and

Table 1. Age, sex, and meat-handling experience of workers in selected meat establishments, 1960 survey, Seattle, Wash.

Type of establishment	Number of establishments	Number of workers			Average age (years)	Total number worker-years of meat-handling experience	Median number worker-years in meat handling
		Total	Male	Female			
Slaughterhouse.....	2	92	70	22	40	1, 146	8.5
Wholesale meat house.....	5	85	55	30	36	917	6.0
Poultry house.....	3	77	26	51	40	690	6.0
Fish house.....	5	64	51	13	40	857	7.0
Total.....	15	318	202	116	39	3, 610	7.0

Table 2. "Septicemic"¹ and suppurative illness reported by meat workers, 1960 survey, Seattle, Wash.

Type of establishment	Number of establishments	Number of workers	Workers reporting at least one episode of "septicemia"		Episodes of "septicemia"		Workers reporting boils or carbuncles	
			Number	Percent	Number	Per 1,000 worker-years	Number	Per 1,000 worker-years
Slaughterhouse.....	2	92	18	20	32	28	4	3.5
Wholesale meat house.....	5	85	18	21	46	50	1	1.1
Poultry house.....	3	77	6	7	7	10	4	5.8
Fish house.....	5	64	21	33	39	45	5	5.8
Total.....	15	318	63	20	124	34		3.9

¹Wounds with associated inflammation, lymphangitis ("streaking"), and fever, necessitating medical treatment, and usually referred to as "blood poisoning," "pork infection," or "fish poisoning."

cultured by standard methods. Only meat with obvious pathological lesions was examined bacteriologically.

Coagulase-positive staphylococci isolated from lesions of workers and meat animals were typed by standard bacteriophage methods using the following 22 phages: 3A, 3B, 3C, 6, 7, 29, 42D, 42E, 47, 52, 52A, 53, 54, 55, 71, 75, 77, 79, 80, 81, 83, and 187.

Findings

Three hundred and seventy-nine meat-handling establishments in Seattle (including all six slaughterhouses located in King County outside the city) employed 2,929 meat handlers during 1959. These workers handled about 362 million pounds of meat during the year, consisting of 145 million pounds of beef, 51 million

pounds of pork, 11 million pounds of lamb, 64 million pounds of poultry, and 91 million pounds of fish. Some of this meat was handled several times, for example, during slaughter, wholesale processing, and retail sale.

Characteristics of the 318 workers in the 15 meat-handling establishments studied intensively provide an indication of the population at risk in this occupation (table 1). Two hundred and two (64 percent) of the workers were men. Ages ranged from 17 to 71 years, with an average of 39 years. The 318 workers had worked an aggregate of 3,610 years as meat handlers and a median of 7 years.

Episodes of "Septicemia"

Eighteen (20 percent) of 92 workers in two Seattle abattoirs reported 32 episodes of "septicemia" while working in abattoirs, which

Table 3. Causes of wounds leading to "septicemia"¹ among meat workers, 1960 survey, Seattle, Wash.

Cause of lesions leading to "septicemia"	Slaughterhouses	Wholesale meat houses	Poultry houses	Fish houses	Total
Knife wound.....	21	21	5	6	53
Pork bone scratch.....	4	18	0	-----	22
Bone scratch (species unknown).....	0	6	0	-----	6
Chicken bone wound.....	0	0	2	-----	2
Fish bone or fin puncture.....	0	0	-----	30	30
Burn (lard, etc.).....	2	1	-----	-----	3
Cause unknown.....	5	-----	-----	3	8
Total.....	32	46	7	39	124

¹ Wounds with associated inflammation, lymphangitis ("streaking") and fever, necessitating medical treatment, and usually referred to as "blood poisoning," "pork infection," or "fish poisoning."

Table 4. Coagulase-positive staphylococci isolated from meat workers, 1960 survey, Seattle, Wash.

Type of establishment	Number of establishments	Number of workers	Workers yielding coagulase-positive staphylococci from nostrils		Number skin lesions cultured ¹	Lesions yielding coagulase-positive staphylococci	
			Number	Percent		Number	Percent
Slaughterhouse.....	2	92	26	28	14	8	57
Wholesale meat house.....	5	85	35	41	6	3	50
Poultry house.....	4	77	28	36	1	1	100
Fish house.....	5	64	13	20	5	3	60
Total.....	15	318	102	32	26	15	58

¹ Lesions were selected for culture by inspection of upper body (men only), head, neck, and upper extremities, and included minor infected cuts and lacerations, paronychia, and furuncles.

Table 5. Source and bacteriophage type of coagulase-positive staphylococci isolated from suppurative lesions of meat workers, 1960 survey, Seattle, Wash.

Type of establishment	Number skin lesions cultured	Lesions yielding coagulase-positive staphylococci		Type of lesion yielding coagulase-positive staphylococci	Bacteriophage type
		Number	Percent		
Slaughterhouse.....	14	8	57	Infected cut..... Infected cut..... Infected cut..... Infected cut..... Infected cut..... Infected cut..... Bruised finger..... Wrist dermatitis.....	Nontypable. 7/54. 6/47/54. 7. 53/80. Not phage typed. Nontypable. 29/52A/79/80.
Wholesale meat house.....	6	3	50	Infected cut..... Infected cut..... Infected cut.....	54. 52/80. Not phage typed.
Poultry house.....	1	1	100	Bone puncture wound.....	53/77.
Fish house.....	5	3	60	Arm boil..... Infected cut..... Infected cut.....	29/52/80. 187. Nontypable.
Total.....	26	15	58		

amount to an attack rate of 28 "septicemic" episodes per 1,000 worker-years (table 2). Four (4.4 percent) of the workers reported experiencing boils or carbuncles, an attack rate of 3.5 per 1,000 worker-years. Fifty-two (57 percent) of the workers reported one or more episodes of miscellaneous skin lesions such as infected knife cuts, bone lacerations, and burns, but many of these lesions were trivial, making it impossible to quantitate the lesions accurately. Paronychia was a common affliction of abattoir workers, who referred to it vernacularly as "run-arounds."

Additional perspective concerning the frequency and causes of suppurative illness among abattoir workers was provided by a first-aid man who had worked 10 years in his present position and was well informed. He recalled two outbreaks of suppurative illness among the workers; one he attributed to a registered male nurse because the outbreak of suppurative wounds ceased when he left; the other outbreak, in 1960, began coincident with processing of deboned hams, with as many as 12 persons at one time being treated for suppurating wounds.

Eighteen (21 percent) of 85 workers in five wholesale meat establishments reported 46 episodes of "septicemia" during a total of 917 years

of work, an attack rate of 50 episodes per 1,000 worker-years (table 2). Only one worker recalled having had boils or carbuncles while working in a wholesale meat establishment. Twenty-three (27 percent) of the wholesale meat workers reported minor infections of knife and bone wounds.

Of 77 workers in poultry-processing establishments, 6 (7 percent) reported seven episodes of "septicemia" during an aggregate exposure of 690 years, an attack rate of 10 episodes per 1,000 worker-years (table 2). Four (5.2 percent) of the workers reported having had boils or carbuncles while working with poultry, an attack rate of 5.8 incidents per 1,000 worker-years.

Of the four poultry workers who had boils, two had them in 1956 while working in the plant which used the chlortetracycline process. These were the only two poultry workers employed in that plant in 1956 who were still working in Seattle poultry-processing plants in 1960. One of the other two poultry workers reporting boils had had her boils and a carbuncle immediately after discharge from a Seattle hospital, where she had undergone a hysterectomy. The fourth worker, who reported having had three boils on his neck 2 years before, gave no indica-

tion of the source of his infection. Thirteen (17 percent) of the 77 poultry workers reported miscellaneous infected knife and bone wounds.

Twenty-one (33 percent) of 64 workers in fish-processing establishments reported 39 episodes of "septicemia," or "fish poisoning," an attack rate of 45 episodes per 1,000 worker-years (table 2). Five (7.8 percent) of the workers reported having had boils or carbuncles, an attack rate of 5.8 such episodes per 1,000 worker-years. One of these five stated that his boils began immediately after hospitalization for "fish poisoning" in 1924 and persisted for several years. The source of infection for the other four workers could not be ascertained. One worker reported recurrent boils of the perineum for 15 years.

Thirty (47 percent) of the 64 fish workers reported miscellaneous infected wounds while working with fish. These workers refer to inflamed bone and fin puncture wounds of their

fingers as "starters," and they are wary lest such lesions progress to "fish poisoning." At the first sign of a "starter" most of them consult a physician, who usually treats such persons with systemic antibiotics. Before antibiotics were available, treatment usually consisted of thorough cleansing with soap and water, hot water-epsom salt soaks, and applications of various antiseptics.

Causes of Wounds

Paronychia and inflammation of knife and bone wounds occur more frequently while working with pork than with beef or lamb, according to many slaughterhouse workers and wholesale and retail meat cutters. This alleged greater likelihood of infection from pork occurs despite equal or greater exposure to beef and many lacerations from beef bones. Many workers refer to severely infected wounds and "septicemia" as "pork infection."

Table 6. Source and bacteriophage type of coagulase-positive staphylococci isolated from pathologic lesions of meat animals, 1960 survey, Seattle, Wash.

Meat animal	Number diseased animals cultured	Coagulase-positive staphylococci obtained		Lesions yielding coagulase-positive staphylococci	Bacteriophage type
		Number	Percent		
Cattle.....	17	4	23	Liver abscess..... Liver and lung (pyemia)..... Lung abscess..... Pneumonia.....	53/77. 7/54. 7/47/54/75. 7/47/54/75.
Swine.....	22	9	41	Maxillary lymph node..... Maxillary abscess..... Maxillary abscess..... Maxillary abscess..... Shoulder abscess..... Pleura and kidney..... Lung-pneumonia..... Ear cut..... Nasal swab.....	Nontypable. Nontypable. 7/47/54/75. 7/47/54/75. 53/77. 77. Nontypable. Nontypable. 53/77.
Poultry.....	13	9	69	Breast abscess..... Breast abscess..... Breast abscess..... Breast abscess..... Leg arthritis..... Leg arthritis..... Leg lesion..... Visceral tumor..... Peritonitis.....	Nontypable. Nontypable. 70. Nontypable. Nontypable. Nontypable. Nontypable. Nontypable. Nontypable.
Sheep.....	3	3	100	Prescapular lymph node..... Lung abscess..... Liver.....	Nontypable. Nontypable. 77.
Total.....	55	25	45		

Among workers in abattoirs and wholesale meat establishments, 42 (54 percent) of 78 "septicemic" episodes were ascribed to knife wounds (table 3); 22 (61 percent) of the balance of 36 such episodes were attributed to pork bone scratches; and only 6 (17 percent) of these wounds were ascribed to other bone scratches.

Among workers in fish-processing establishments, 30 (77 percent) of 39 "septicemic" episodes were the result of lacerations caused by fish bones or fins. The workers usually ascribed the fish bone and fin lacerations that caused "septicemia" to certain fish, for example, red snapper, cod (ling, rock, and red), and sole, rather than salmon. Whether these impressions are correct and, if so, whether the difference is independent of the size and the bone and fin anatomy of the fish cannot be answered by this study.

Bacteriological Findings for Meat Workers

Of the 318 meat workers surveyed, 102 (32 percent) yielded coagulase-positive staphylococci from their nostrils (table 4). The staphylococcal carrier rates were roughly equal for each category of worker, except the rate among fish workers was slightly lower, a finding of doubtful significance.

Fifteen (58 percent) of 26 specimens taken from various minor lesions, for example, minor infected lacerations, paronychia, and furuncles, yielded coagulase-positive staphylococci. No major lesions were discerned on any of the workers examined. The minor lesions were observed with approximately equal frequency among the various categories of workers, except that only 1 of 77 poultry-processing plant workers had a skin lesion worthy of culture.

The yield of coagulase-positive staphylococci from the meat workers, according to source and bacteriophage type, is presented in table 5.

Bacteriological Findings in Meat Animals

Of 55 lesions of meat animals cultured, 25 (45 percent) yielded coagulase-positive staphylococci (table 6). Active suppurative lesions seemed more productive of staphylococci than the less active, but more obvious, encapsulated lesions routinely condemned by veterinary inspectors.



Figure 1. Staphylococcal abscesses (pyemia) of bovine liver and lung



Figure 2. Staphylococcal abscess of porcine shoulder

The yield of coagulase-positive staphylococci from the meat animal lesions, according to source and bacteriophage type, is presented in table 6.

The pyemic liver and lung specimens, with multiple abscesses, from which type 7/54 staphylococci were isolated are shown in figure 1.

One of the isolations of type 53/77 staphylococci from pork was from a shoulder abscess (fig. 2) which may have resulted from vaccination. Maxillary lymph nodes of one hog's head, which was condemned as tuberculous, proved negative for tuberculosis by culture but yielded coagulase-positive staphylococci.

Interestingly, eight of the nine isolates of coagulase-positive staphylococci from poultry were not typable by means of the phages used; the single isolate identified was type 70. One of the nontypable strains of staphylococci isolated from poultry was from a diseased tibio-metatarsal joint (fig. 3).

Staphylococci with phage patterns containing type 80 (commonly referred to as the 80/81 strain) were isolated from four human lesions but not from any meat animal lesions. Phage types 7/54 and 53/77 staphylococci were isolated from lesions of both animals and meat workers. With these exceptions no species-specific distribution of phage patterns is apparent except for the suggestively greater proportion of nontypable staphylococci isolated from poultry.

Phage type 7/47/54/75 staphylococcus, isolated from both bovine and porcine lesions, is similar to but not identical with the type 6/7/47/54/70/73/75 staphylococcus which caused one of the food poisoning incidents described in the introduction. Type 7/47/54/75 staphylococcus was also isolated with moderate frequency from lesions at antemortem and postmortem examinations of persons hospitalized in Seattle during 1960, according to an unpublished study by Ravenholt and Mulhern.

Discussion

The outbreak of boils among workers in a poultry-processing plant described in the introduction is the only such outbreak in this community in at least the last 15 years, according to the poultry sanitarian, the plant managers, and the histories obtained from the 77 poultry workers. That outbreak coincided in time and place with the use of the chlor-tetracycline process, which was discontinued shortly thereafter. No other poultry-processing plant in this community has used tetracycline in a similar manner. These findings suggest that the use of tetracycline in the processing of poultry somehow caused the outbreak of type 80/81 staphylococcal pyoderma, and if so, that possibly hospital outbreaks of type 80/81 staphylococcal infection are in some way, not yet defined, related to the use of tetracycline in that environment.

Findings from several outbreaks of staphylococcal food poisoning, including the two described in the introduction and others studied by Ravenholt, indicate that meat, perhaps especially pork, is not infrequently seeded with pathogenic staphylococci at the time of slaughter. This seeding may be an important



Figure 3. Staphylococcal arthritis of avian tibio-metatarsal joint

factor in the epidemiogenesis of staphylococcal food poisoning. Certainly, staphylococcal disease of meat animals does occur, and it seems likely that infected meat (especially when combined with poor temperature control) can serve as a source of staphylococcal infection for man. Furthermore, when meat handlers serve as the direct source of staphylococcal contamination of meat and other foods, they may perhaps do so as a result of occupationally acquired infection from meat.

Some animals do suffer from staphylococcal pyemia or septicemia at the time of slaughter. The frequency, distribution, and significance of such infections should be determined. What is the incidence of significant infection of various species of meat animals with various pathogenic staphylococci? In various areas? At various times of the year? And what causes

the incidence of such infection to vary? When these questions are answered, it may be possible to produce a more healthful meat supply.

The incidence of pyoderma recalled by the meat workers is undoubtedly less than actual experience because of memory loss and because workers with unusually great difficulty would probably seek other employment.

The cutaneous lesions and episodes recalled by meat workers in this study were undoubtedly caused by more than one type of micro-organism, perhaps including *Erysipelothrix rhusiopathiae*, which is known to cause erysipeloid of meat workers (6) and which would not have been detected by the cultural methods employed.

The failure to isolate type 80/81 staphylococcus from meat animal lesions contrasts with the frequency with which this type has been recovered from human lesions in this and other studies (1,2), and suggests that type 80/81 may be especially a human pathogen. It is perhaps significant that in several instances where type 80/81 staphylococcus has caused bovine mastitis, the infection has apparently been acquired from closely associated humans (7-9). In an early study of the relationship of human and animal staphylococcal disease, Smith (10) isolated one type of staphylococcus from human and bovine mastitis, but at that time (1948) type 80/81 staphylococcus had not yet been identified as such, and so his study does not provide a measure of the occurrence of this type among animals. Rountree et al. (11) did not report any type 80/81 staphylococcus among the "human" types they isolated from various domestic animals in Australia in 1956, though they did isolate type 6/47/54/75 staphylococcus from guinea pigs, which is the same type as the 7/47/54/75 isolated from bovine and porcine lesions in the current study. Similarly, Seto and Wilson (12) did not report any type 80/81 staphylococcus among the 102 cultures of bovine origin which they tested with type 81 phage in Wisconsin in 1958.

Certainly, for humans, type 80/81 is generally the most virulent and pathogenic of currently prevalent staphylococci (1-5). In addition, it appears to possess unique mammopathic qualities, as indicated by its propensity to cause bovine mastitis (7-9) and by its unfailing presence in outbreaks of nursery-derived staphylo-

coccal disease which include breast abscesses of newborn infants as well as of their mothers (1-5).

It may be that the relationship of type 80/81 staphylococcus to all staphylococci and man is somewhat analogous to that of *Salmonella typhi* to all salmonellae and man. If so, the means and ease of controlling type 80/81 staphylococcus and other staphylococci may differ. For example, if type 80/81 were identified as the cause of a food poisoning outbreak from eating meat, one should perhaps seek the source of the outbreak especially among the foodhandlers, whereas if the outbreak were caused by another type, such as 7/47/54/75, one should perhaps suspect that the meat may have been seeded with the causative organism before it entered the kitchen. Similarly, infection of a newborn infant or a wound with type 80/81 staphylococcus should perhaps suggest the hospital or at least another human as the source, regardless of the antibiogram of the organism. It may be possible to greatly reduce the prevalence of type 80/81 staphylococcus in a community by prevention of hospital-acquired infection, without affecting the prevalence of other types. Further and much more extensive study of the distribution of various types of staphylococci according to species of animal is needed to answer the questions raised by this study.

The findings of this study do indicate clearly, however, that meat animals are frequently infected with pathogenic staphylococci at slaughter. Therefore, prevention of food poisoning is particularly dependent on proper temperature control of meat rather than on identification and control of infected food handlers.

Summary

An outbreak of boils and carbuncles among workers in a poultry-processing plant in 1956 in Seattle, Wash., and the findings of investigations of several outbreaks of food poisoning in the community in recent years suggested that considerable staphylococcal disease may derive from nonhuman reservoirs of infection. To explore this possibility, an investigation of staphylococcal disease of meat animals and meat workers was undertaken in 1960.

Histories of suppurative illness and swab

specimens of skin lesions (when present) and nostrils (routinely) were obtained from 318 meat workers in 15 meat-handling establishments in Seattle. These workers reported 124 episodes of "septicemia," an attack rate of 34 per 1,000 worker-years. Many of them stated that pork bone lacerations seemed more likely to become infected than lacerations from other causes.

Coagulase-positive staphylococci were obtained from the nostrils of 102 (32 percent) of the 318 workers.

A considerable variety of staphylococci were isolated from lesions of meat animals and meat workers. But type 80/81 staphylococcus, which was isolated from lesions of four workers, was not isolated from any of the animal lesions.

From these and other findings reported in the literature, we suggest that type 80/81 staphylococcus is primarily a human pathogen, with unique pathogenic and especially mammapathic qualities and that its relationship to other staphylococci and man may be somewhat analogous to that of *Salmonella typhi* to other salmonellae and man. Conversely, certain other types of staphylococci may primarily parasitize certain other animal species and only secondarily afflict humans.

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Tests demonstrated that normal animals do not acquire nocardial mastitis by oral intake of infectious milk. The organism is also effectively destroyed in commercially processed milk which meets the minimum pasteurization standards.

Oral Infectivity and Thermal Resistance of *Nocardia asteroides* in Milk

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THE RECOGNITION of *Nocardia asteroides* as an etiological agent of bovine mastitis was reported from California in 1957 (1,2). Since that time the disease has been recognized in six California and three Hawaiian herds and has been reported from Texas (3), Massachusetts (4), and Alabama (letter from C. S. Roberts to Dr. L. Ajello, Communicable Disease Center). Previous reports of the thermal resistance of the organism (5,6) and of its infectivity for man (7-11) suggested public health complications might arise from this disease in cattle.

The most probable site of primary human infection appears to be the lungs (8,9,11,12), although injuries to the teeth and gums may

also serve as portals of entry (13,14). In addition, it has been stated that *N. asteroides* may be transmitted to man in milk (15). Thus, the oral infectivity for susceptible species and the susceptibility of the organism to pasteurization were important factors to consider when the presence of the organism in a universally consumed food became known.

This paper reports the results of experiments to investigate the susceptibility of swine, calves, and guinea pigs to this organism when exposed by the oral route and to study the thermal resistance of *N. asteroides* in milk.

Oral Transmission Test Methods

All oral transmission trials were conducted with milk from infected cows. Weekly cultural analyses of the milk were made, and the population of *N. asteroides* was estimated by plate counts. Guinea pigs, calves, and young swine were fed fresh milk from infected bovine mammary glands. All three species had previously been shown to be susceptible to infection by the intravenous and intraperitoneal routes.

Calves. Five dairy calves 1 week to 1 month of age were fed milk from infected cows for 1 to 5 months. Approximately 2 to 4 million organisms were consumed daily. These ani-

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imals were skin tested prior to and subsequent to the feeding period. They were bled periodically and their serums tested for complement-fixing antibodies for *N. asteroides* (16).

At necropsy cultural examinations were made of swabs from the larynx, esophagus, trachea, rumen, omasum, small intestine, and tissues from mesenteric lymph nodes. Two control calves receiving normal milk were handled in an identical fashion. One calf which had received infectious milk for 3½ months without visible effect was switched to normal milk and injected both intravenously and intraperitoneally with 2 billion organisms. Subsequently, the clinical response, skin test reactions, and complement fixation titers of this animal were observed.

Guinea pigs. Three guinea pigs were fed milk containing 20,000 to 30,000 *Nocardia* organisms per milliliter. Milk consumption by these animals was estimated at 10 ml. per animal per day. These animals were killed at intervals over a 4-month period and examined for the presence of *Nocardia* in the alimentary canal or for lesions of nocardiosis.

Five guinea pigs were anesthetized, their pharyngeal mucous membranes were scarified, and infectious milk was introduced into the oral cavity. These animals were subsequently fed infectious milk ad lib as described for the above group.

Aspiration of infectious milk was induced in nine guinea pigs. The guinea pigs were anesthetized and 0.5 ml. of milk containing 100,000 *Nocardia* organisms per milliliter was placed in the oral cavity. The nostrils of each animal were manually blocked until audible aspiration occurred. The guinea pigs of this group were examined culturally and histologically for infection after a period of 3 weeks, unless death occurred earlier.

Swine. Five weanling swine weighing 35 to 40 pounds were placed on a ration of grain and milk from infected udders which contained approximately 1,000 viable *Nocardia* organisms per milliliter. During a 3-month period these animals consumed 2 to 4 liters of milk daily containing 1 million viable nocardial elements per liter. These animals were observed for clinical illness and were culturally examined at necropsy. Cultural examination included

swabs taken from the esophagus, stomach, small intestine, large intestine, and cecum plus aseptically harvested specimens of mesenteric lymph node, spleen, liver, lung, heart blood, and bile.

Thermal Resistance Test Methods

To determine the resistance of *N. asteroides* to pasteurization, two types of milk samples were prepared for use in the time-temperature trials. The first consisted of normal milk to which culture material of a strain of *N. asteroides* was added. This strain had been isolated from a dairy cow infected with a severe form of nocardial mastitis. The strain was grown on tryptose agar containing 5 percent washed bovine erythrocytes and had been transferred on this medium innumerable times over a 2-year period. Microscopic examination of the organisms added to the milk showed that many of the mycelial elements were fragmented into rod and coccoid forms.

The second sample consisted of fresh milk drawn from infected bovine mammary glands. These glands were naturally infected or had been experimentally infected as described previously (17). All of these glands showed marked clinical signs of infection. Microscopic examination of this milk showed predominantly branched mycelial forms of *Nocardia*.

Heating procedure. To simulate commercial pasteurization, we adopted a finely controlled method of heat exposure similar to the technique used by Enright and co-workers (18) in studying thermal inactivation of *Coxiella burnetii*. This method employed a large-capacity water bath equipped with a mechanical stirring device and mercury thermostat capable of maintaining the temperature of the water within $\pm 0.2^\circ$ F. Milk samples containing the organisms were sealed in containers, immersed in the water bath, and vigorously agitated during the heating period. When the critical milk temperature was reached, the holding period was determined by stopwatch timing and rechecked against the time-temperature record of each test. At the end of the holding period the milk samples were immersed in a circulating cold water bath (40° F.). A thermistor-actuated, continuously recording potentiometer recorded the exact

temperature changes during heat-up, holding, and cool-down periods. The time sequences were measured both manually and by means of a mechanical timing device arranged to record at 1-second intervals. After cooling, the samples were plated in duplicate on tryptose agar containing 5 percent washed bovine erythrocytes. These preparations were incubated for 96 hours at 37° C., after which time colony counts were made.

Survival and destruction end points. As used in this study, the end point of survival was the maximum time a sample could be heated at a given temperature and still contain demonstrably viable elements of *N. asteroides*. The time of destruction, or negative end point, was the minimum time a sample had to be heated at a given temperature to destroy detectable evidence of viable elements of the organism.

Time correction. Burton's formula (19), based on the present pasteurization curve, was used to estimate the duration of heat exposure of the organisms occurring during heating and cooling. This time was then added to the time at the holding temperature in order to estimate the total, or corrected, thermal inactivation time at the holding temperature. While this method is not theoretically correct, it provides an estimate in which the error is relatively small.

The cultural techniques (2) and the skin test and complement fixation techniques (16) have been described in previous papers.

Oral Transmission Results

Calves which consumed infectious milk for 1 to 5 months showed no evidence of clinical illness, nor were lesions detected at necropsy. Neither skin test reaction nor positive complement fixation titer was demonstrable in these animals at the conclusion of the trial. At necropsy, *N. asteroides* was isolated from the larynx, esophagus, rumen, and omasum of some of the exposed animals but not from the small intestine. The organism was isolated from the trachea of one calf, but no attendant lesions of the trachea, bronchi, or lungs were seen.

Calf 431, which had been fed nocardial milk for 3½ months, was switched to normal milk and was then injected intravenously and intraperitoneally with 2 billion *Nocardia*. A posi-



Figure 1. Lung lesions observed in guinea pig after experimentally induced aspiration of milk containing *Nocardia asteroides*

tive clinical response followed, marked by a temperature rise which peaked at 105.3° F. 2 days after inoculation. Four weeks after inoculation the calf had a positive skin test and a complement fixation titer of 1:32. Both of these tests had given negative results when used prior to feeding milk containing the organism, and they repeatedly gave negative results during the 3½ months that the infectious milk was fed. The calf was killed and examined 5 weeks after inoculation. *N. asteroides* was cultured from an encapsulated lesion occurring at the peritoneal inoculation site.

Guinea pigs fed infectious milk ad lib for 1 to 4 months showed neither illness nor lesions at necropsy. *N. asteroides* was isolated from the esophagus but not from the stomach, small intestine, or cecum. Two of the five guinea pigs whose pharyngeal mucous membranes were scarified prior to receiving infectious milk died within 48 hours. The inframandibular region of each was greatly swollen from a streptococcal cellulitis. The remaining three guinea pigs showed neither illness nor lesions at

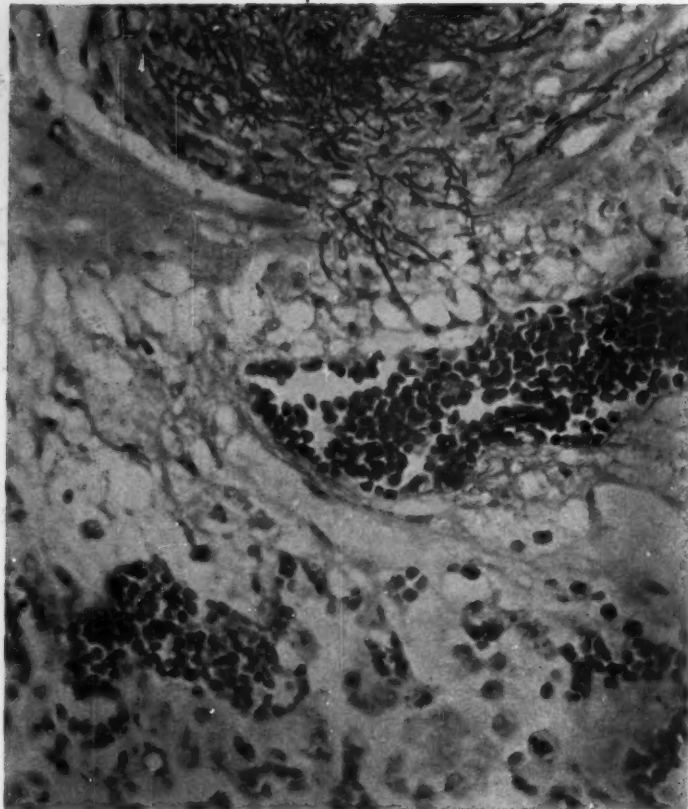


Figure 2. Lung lesion in guinea pig: extension of the mycelial elements from the bronchiolar lesion at the top into the vessel at the center (Gram-Weigart stain X 400)

necropsy, nor were *Nocardia* organisms recovered by cultural methods. Of the nine guinea pigs inoculated by aspiration, four died of nocardial pneumonia and another had well-developed lesions of pulmonary nocardiosis when examined at necropsy, 20 days after aspirating the infectious milk.

Necropsy of the guinea pigs developing nocardial pneumonia after aspiration of the infectious milk showed firm, red, atelectatic areas throughout the lungs, and numerous 1 to 2 mm. foci containing thick pus were observed (fig. 1). Adhesions between the lungs and the thoracic cage were noted. Tissue sections from the lungs showed numerous necrotic foci with early fibrotic changes occurring at the periphery of the lesion. Extensive edematous infiltration of the alveoli was seen with some alveoli being

packed with exudate as were the neighboring bronchioles. Extension of the lesions to adjacent vessels was noted (fig. 2). *N. asteroides* was isolated from and demonstrated histologically in the lung lesions of the animals. Metastatic infection of the spleen of one animal was observed.

It was thought that the results of oral transmissibility studies on the normal ingestion of infectious milk by calves might have been altered by the complexity of the bovine stomach. Guinea pigs, while susceptible to *N. asteroides* and possessing a simple stomach, did not consume milk readily. Swine were investigated as a third species for oral transmissibility studies because they possessed a simple stomach, would consume milk readily, and were susceptible to infection by parental inoculation.

The five swine fed infectious milk averaged a 150-pound gain in body weight during the 90 days' observation. No signs of illness were noted during the feeding period, nor were lesions detected in any of the swine at necropsy. Cultural examinations resulted in recovery of the organism from the esophagus of one animal, but none was isolated from lower areas of the digestive canal.

The results of the oral transmissibility trials are summarized in table 1.

Pasteurization Results

Early trials using culture-inoculated milk that was heated in an ordinary water bath at 147.2° F. and 150.8° F. for 30 minutes indicated that *N. asteroides* survived these exposures which exceed the minimum recommendations for commercial pasteurization. These results were in agreement with those of others (5, 6) who used culture-inoculated milk in their trials.

When fresh milk from infected udders was heated in a carefully controlled system, in no instance did the organisms drawn from infected glands survive the recommended pasteurization

conditions of 145° F. for 30 minutes or 161° F. for 15 seconds. These results are presented in figure 3. When milk from infected udders was held at 40° F. for 3 days or frozen for 3 months, the organisms did not appear to have a heat resistance differing from that of organisms in fresh milk from infected udders.

In table 2 are presented the pertinent results of heating milk from infected cows and of heating culture-inoculated milk. These results are arranged according to certain selected temperatures and the maximum time of survival and minimum time of destruction at these temperatures. These times have been corrected to include the lethal effect of the heat-up period as previously described. The times are estimations of the length of the holding period at a certain temperature if the holding temperature was attained instantaneously. The negative end points, using milk from infected cows, are below those of the presently recommended minimum standards for the pasteurization of milk.

It is unlikely that milk from infected cows being pasteurized commercially would contain organism populations which exceeded those in this study. Infected glands observed during

Table 1. Transmissibility of *Nocardia asteroides* through milk to susceptible animals

Species	Method of exposure	Clinical illness	Necropsy	<i>Nocardia</i> recovered	Immune response	
					Skin test	Average complement fixation titer
3 guinea pigs.	Fed ad lib 1-4 mo.	None	Neg.	Esophagus (2) ¹		
5 guinea pigs.	Scarified pharyngeal mucosa, fed ad lib 4 mo.	2 died within 48 hrs.	Streptococcal cellulitis.	None.		
9 guinea pigs.	Aspiration	3 none	Neg.	None.		
5 calves	Fed 1-5 mo.	4 died; 1 ill.	Lung lesions	Lungs (5); spleen (1).		
			Neg.	Esophagus (2); rumen (2); larynx (1); trachea (1); omasum (1).	Neg.	Neg.
Calf 431	Fed 3½ mo., then challenged intravenously and intraperitoneally.	Noted after 2 days' temperature 105.3° F.	Lesion at inoculation site.	Lesion	Positive.	1 : 32
2 calves	Fed normal milk 3-5 mo.				Neg.	Neg.
5 swine	Fed 1-3 mo.	None	Neg.	Esophagus (1)		

¹ Numbers in parentheses indicate the number of animals in which the finding was made.

this study did not shed in excess of 500,000 organisms per milliliter of milk. Glands shedding 10,000 or more *Nocardia* organisms per milliliter are usually quite indurated and are not likely to be milked for commercial purposes. The dilution factor from bulk handling of milk would be sufficient to hold the count well below the range encountered in these tests.

Discussion

In view of these findings it appears unlikely that infection will result from the consumption of commercially processed milk from udders shedding *N. asteroides*. Oral consumption of infectious milk was not an effective means of transmission. Three susceptible species, subjected to diets of infectious milk for several months, consistently failed to develop detectable infection from simple oral exposures. Even deliberate injury of the pharyngeal epithelium of guinea pigs coupled with immediate superimposition of infectious milk on the traumatized area failed to produce nocardial infection. However, the possibility of infection resulting from the aspiration of small quantities of milk

Table 2. Pertinent times and temperatures resulting in survival or destruction of *Nocardia asteroides* in milk

Organism source	Organism count before heating (per milliliter)	Holding temperature (° F.)	Maximum survival time ¹ (minutes)	Minimum destruction time ¹ (minutes)
Infected cow (fresh milk)	154,000	140	70.0	75.0
	220,000	145	12.0	13.0
	114,000	150	3.1	3.4
	323,000	155	.6	.8
	40,000	161	.21	.23
Infected cow (milk held 3 days at 40° F.)	5,800	145	2.0	3.0
Culture-inoculated milk	165,000	145	40.0	-----
	430,000	161	.33	.49

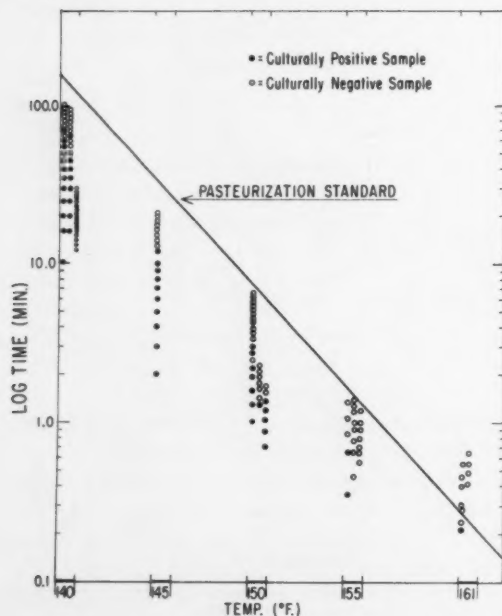
¹ Times were corrected for the heat-up interval.

laden with *Nocardia* organisms has been established. These results tend to support the observation of Weed (11), who considers the lung as the most probable organ for primary infection in man.

Previous reports of the survival of *N. asteroides* beyond the limits of pasteurization were derived from experiments in which the milk was inoculated with undefined numbers of organisms from culture media. While there appear to be differences in heat susceptibility between organisms from infected glands and those from culture media, our results indicate that comparatively high numbers of *N. asteroides* in fresh or refrigerated milk from infected udders are susceptible to current pasteurization techniques.

A possible threat to public health remains because many persons, especially dairymen and their families, consume raw milk. This practice has been observed in dairies where the disease in animals is known to exist. Furthermore, since there are indications that some of the bovine isolates are of unusually high virulence (17), personnel handling infected animals should use precautions against self-contamination. For this reason, and the danger of possible aspiration of infectious milk, the practice of consuming raw milk from infected herds should be condemned, and the slaughter of animals known to be infected should be recommended.

Figure 3. Thermal resistance of *Nocardia asteroides* in milk from infected mammary glands



Summary

Oral infectivity of *Nocardia asteroides* was not demonstrable in normal guinea pigs, swine, and calves fed milk containing the organism. Injury of the pharyngeal epithelium of guinea pigs immediately preceding their exposure to infectious milk did not result in infection. Immunological reactions of calves did not imply that close association between host and parasite had developed during the period of feeding of the infectious milk. *Nocardia* organisms were cultured only from the upper alimentary tract of these animals.

Aspiration of small quantities of infectious milk resulted in the development of nocardial pneumonia and the death of several guinea pigs.

Milk from infected udders subjected to carefully controlled pasteurization trials of 145° F. for 30 minutes and 161° F. for 15 seconds was repeatedly shown to be free of viable elements of *N. asteroides*.

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Minnesota's Alcohol Education Program

To provide a sound program in alcohol education and to clear up misinformation regarding alcohol, the Departments of Health and Education of the State of Minnesota are publishing in *School Health News* a series of articles on alcohol education by Paul Riddle, Minnesota public health education consultant in school health. Several booklets have also been collected and are available for use in educating adults and teenagers alike that alcoholism is an illness that threatens individuals from all walks of life. These materials consist of statements of points of view about what alcohol is, why people drink and the personality of the alcoholic, effects on the individual and the community, and attitudes toward alcohol. A careful study of these booklets is intended to enable individuals to deal with the issue intelligently and to face the facts objectively, as a basis for the development of sound personal convictions and attitudes.

The series of articles in *School Health News* advocates formal instruction on alcohol which deals with its complexities and indicates how widespread is the responsibility for control of alcoholism. Parents and teachers are encouraged to provide objective and unprejudiced information about alcohol in relation to teenage beliefs, attitudes, and practices. As teenagers observe drinking among adults, it is important that they do not conclude that drinking is a way of emulating adult behavior.

"A teenager experimenting with drinking should not be condemned," one article states. "Adolescent drinking is a symptom of the growing pains of approaching adulthood."

Studies to determine student drinking attitudes and behavior indicate that the pattern and social context of drinking by adolescents reflects the pattern and social context of drinking among adults, states Riddle.

In one issue, *School Health News* encloses an article by Jean Libman Block, "Alcohol and the Adolescent," originally published in *Parents' Magazine*.

A child cannot be counseled with wisdom, states Block, until the parent examines his own attitude toward alcohol with complete honesty and decides what attitude he wishes his child to take. As children look to their parents for guidance in the

matter of drinking, it is the duty of the parent to assist the child in developing a good attitude toward alcohol and to live by it.

The Minnesota program also employs educational materials obtained from other responsible sources, such as the Yale Center or the Public Health Service.

Raymond G. McCarthy has prepared the booklets, "Facts About Alcohol," Instructor's Guide to Facts About Alcohol," "Discussion Guides for Questions About Alcohol," and a kit, titled "Exploring Alcohol Questions," containing six leaflets, published by the Yale Center of Alcohol Studies, to be used not only by science and health teachers but also in other classes, such as biology, physiology, English, and social studies, in which the alcohol question can be attacked effectively.

The booklets contain detailed suggestions for presenting information on alcohol and provide a common background for students while focusing attention on the individual's decision about drinking and the factors that may influence him in making this decision.

The "Discussion Guides for Questions About Alcohol," a series of three booklets on the physiological effects of alcohol, community opinions on alcohol problems, and individual attitudes toward alcohol, indicate that the use of alcohol does contribute to social distress—but that it is drinking plus certain types of personalities plus certain kinds of situations that create alcoholism.

Booklets prepared by the Department of Health, Education, and Welfare and the Metropolitan Life Insurance Company, both titled "Alcoholism," discuss what alcohol is, the causes of alcoholism, and means of treatment and rehabilitation for the alcoholic. Medical treatment, psychotherapy, and Alcoholics Anonymous are discussed. The booklets offer data to suggest that 6 out of every 10 adults in the United States use alcoholic beverages, and that 1 out of every 15 persons who drink is prone to alcoholism.

The State of Minnesota believes that alcoholism can be prevented. The key to the task is to know what alcoholism is, how it develops, and where aid may come from. The primary goal of the alcohol education program is prevention.

Respiratory and Enteric Viruses in Man and Animals

FRANCIS R. ABINANTI, D.V.M., Ph.D.

IN CONTRAST with the usual studies of the zoonoses, which focus on transmission of the infectious agent from animals to man, this study focuses on the similarities of the animal virus to the human virus and compares the infections produced in each species by these viruses. Viruses of the respiratory and enteric tracts of man and animals are discussed here.

Respiratory Infections

Most of the current studies of respiratory diseases of man and animals are aimed at determining their virus etiology, and considerable progress has been made, particularly since the advent of tissue culture methods.

The relatively new hemadsorption technique (1) is used extensively in work with many of the respiratory disease viruses. Essentially, this is a system in which red blood cells of various species, depending on the virus, are added to the infected tissue culture tubes. The red blood cells will adhere to the surface of the infected cells. Hemadsorption has been used for establishing the identity of isolates as well as isolating the virus from clinical specimens.

Hemadsorption is a specific phenomenon which is dependent upon the hemagglutinating properties of the virus. It was first reported in 1957 by Vogel and Shelokov who worked first with the influenza viruses and later extended these studies to certain other members of the myxovirus group.

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This technique has been used to good advantage in our laboratories. The recovery of parainfluenza 1, 3 (2), and possibly 4 (3) viruses, from children was largely due to the use of hemadsorption because many of the strains of parainfluenza 3, particularly, produced no cell degeneration on original isolation from children, and the virus was detected only by the use of hemadsorption. The first suggestion that a virus recovered from cattle with shipping fever might be a myxovirus resulted from the use of hemadsorption. It was then relatively simple, by using type-specific human parainfluenza 3 antiserum, to demonstrate the relationship of this virus to the human virus (4).

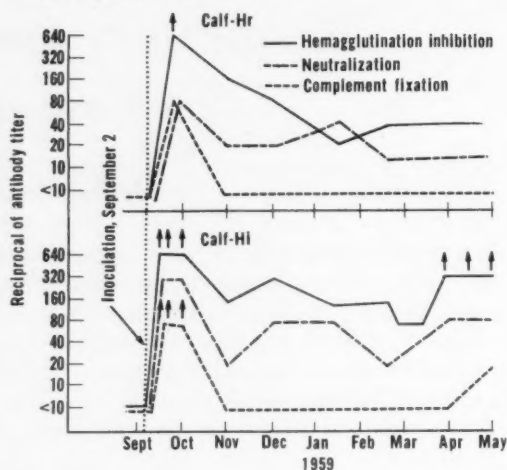
When this newly described hemadsorption technique was used in conjunction with monkey kidney tissue cultures, two new myxoviruses were recovered from children with respiratory illnesses (2). One of the viruses, the present parainfluenza 3, was significantly associated with febrile illness during an outbreak of respiratory disease in a nursery. About the same time the present parainfluenza 1 virus was also recovered from children. In a study of 1,738 children in three hospitals in the Washington, D.C., area, one or the other of these two hemadsorption viruses was recovered from 54 (6 percent) of 879 patients with respiratory disease. It appeared that the two viruses were capable of causing a wide variety of clinical manifestations including croup, pneumonia, bronchiolitis, pharyngitis, and mild febrile disease. Table 1 shows the recovery of parainfluenza 1 and 3 viruses from children with various respiratory disease syndromes.

Evidence of year-round occurrence of hemadsorption virus infections has been obtained (5). Other recent evidence relative to reinfection of

children with these viruses indicated that the first infection would appear to be the most serious one and would result in a clinical illness, whereas subsequent infections were mild or inapparent (5). Thus, with these viruses it is probably quite possible to have repeated infections from childhood on through adult life, but clinical illness is observed most frequently in children experiencing their first infection. It is likely that a similar situation exists in cattle relative to infection and reinfection with parainfluenza 3 virus. Infections with these agents can occur the year round, but clinical illness is generally produced in the fall and winter months. There may be a similar occurrence in cattle; however, there is as yet no evidence to substantiate such a claim. Why such a seasonal relationship exists no one knows, but it could account for the occurrence in human and cattle communities of many infections which cause no illness, whereas in other communities where infection may occur during the fall and winter the same virus may account for a considerable amount of illness.

Progress in the study of respiratory diseases of animals has also gained new momentum since the use of tissue culture methods. Two viruses of importance in bovine respiratory disease have been studied in tissue cultures. The first was the virus of infectious bovine rhinotrachei-

Development and persistence of hemagglutination and complement-fixing antibodies following infection



tis (IBR), and the second, the bovine strain (SF-4) (6) of myxovirus parainfluenza 3. I shall confine my remarks to studies of parainfluenza 3.

Parainfluenza 3 virus has been recovered repeatedly from cattle with respiratory disease (6, 7). Definitely establishing this virus as a cause of respiratory disease, however, has been somewhat difficult, with one exception. According to Sinha and associates, this exception

Table 1. Recovery of parainfluenza 1 and 3 viruses from 879 hospitalized children with various respiratory disease syndromes ¹

Illness	Number tested	Virus isolation					
		Parainfluenza 3		Parainfluenza 1		Total	
		Number	Percent	Number	Percent	Number	Percent
Pneumonia.....	244	4	1.6	0	0	4	1.6
Croup.....	54	2	3.7	9	16.7	11	20.4
Bronchiolitis.....	77	1	1.3	0	0	1	1.3
Pharyngitis ²	57	2	3.5	3	5.3	5	8.8
Mild respiratory tract disease:							
Febrile.....	311	7	2.2	19	6.1	26	8.9
Afebrile.....	108	4	3.7	2	2.8	6	5.6
Undetermined.....	28	0	0	1	3.6	1	3.6
Total.....	879	20	2.3	34	3.9	54	6.1

¹ See reference 2.

² Including patients with pharyngitis and bronchitis combined or mild pharyngeal component with bronchitis predominating.

occurred during the study of an outbreak of shipping fever in a group of cattle recently transported from Texas to Kansas. Many of the cattle developed severe respiratory signs and several died or were killed. Parainfluenza 3 virus was recovered from the nasal secretions and from lung tissue of many of these animals. Affected cattle showed fourfold or greater antibody rises in their convalescent serums. However, the most important evidence in this outbreak was that the animals which did not become sick had preexisting parainfluenza 3 antibody.

In our studies (7, 8) we were able to recover virus from sick cattle and demonstrate fourfold or greater antibody rises in the convalescent serums but were never fortunate enough to show that animals with preexisting antibody were refractory to the disease. We were able to infect experimentally a calf with the virus and produce a rise in temperature and mild respiratory symptoms. The chart shows the antibody response of this calf (Hi) following infection (8). Also, its penmate (Hr) became infected

Table 2. Distribution by month of parainfluenza 3 antibodies measured in cattle by complement fixation and hemagglutination inhibition tests

Month	Num-ber tested	Complement fixation		Hemagglutination inhibition	
		Num-ber positive ¹	Per-cent positive	Num-ber positive ²	Per-cent positive
1958					
June.....	71	4	5.6	58	81.6
July.....	148	9	6.8	127	85.8
August.....	82	9	10.9	46	56.1
September.....	30	3	10.0	24	80.0
November.....	129	29	22.9	85	65.9
December.....	76	18	23.2	55	70.5
1959					
January.....	³ 112	5	4.4	85	76.0
February.....	³ 31	3	9.6	23	74.1
March.....	³ 107	3	2.8	92	86.0

¹ Complement fixation antibody of 1:8 or greater.

² Hemagglutination inhibition antibody of 1:20 or greater.

³ These serums were tested approximately 1 year after the other serums were tested.

Table 3. Distribution by State of parainfluenza 3 antibodies measured in cattle by hemagglutination inhibition tests

State	Number tested	Number positive (1:20 or greater)	Percent positive
Maryland.....	339	245	72
Virginia.....	454	319	70
Pennsylvania.....	134	114	85
Indiana.....	163	138	84
Iowa (Sioux City).....	32	17	53
Minnesota (St. Paul).....	28	21	75
Michigan.....	21	20	95
Illinois (Chicago).....	20	14	70
Missouri (East St. Louis).....	17	15	88

even though the virus was administered in separate quarters. This calf showed no clinical signs of infection. Of further interest is the evidence of reinfection shown by one of these calves (Hi). This would appear to be an analogous situation to that observed by Chanock and others (5) in which reinfection of children was common and produced a mild or inapparent infection.

A serologic survey of cattle being slaughtered was conducted in Baltimore, Md. (8). Table 2 shows the numbers of cattle positive by months as measured by the hemagglutination inhibition and complement fixation tests. While the numbers of positive cattle by the hemagglutination inhibition test were essentially similar each month, the complement fixation test (a test showing only recent bovine infections) showed a marked increase in positives in November and December—months when shipping fever or bovine respiratory disease is more prevalent.

As shown in table 3, cattle from all of the States tested had varying numbers of positives. Roughly 75 percent of all cattle tested had antibodies. Serologic evidence of infection of cattle has also been shown from as far off as Tahiti and Japan.

Preliminary studies with formalin-inactivated vaccines suggest that protection can be produced (9).

Parainfluenza 3 viruses recovered from man and animals (4), although sharing an antigenic similarity, as in table 4, show a species distinction (10). Guinea pigs exposed to a single aerosol infection with the human or bovine pro-

totype viruses developed fourfold or greater antibody responses to the homologous than to the heterologous strain of the virus. However, when guinea pigs were exposed to multiple infections with the same viruses, the ability to differentiate serologically the strains of virus coming from humans and bovines was lost.

Gastrointestinal Tract Viruses

By use of the tissue culture method, a great number of viruses have been recovered from the gastrointestinal tract of man. Many of these belong to the enterovirus group (11). Certain of these enteroviruses (poliomyelitis, Coxsackie, and some of the ECHO viruses) are known to cause disease in man. However, the relationship of many of the enteroviruses to disease is circumstantial or unknown.

Many viruses have also been recovered from the gastrointestinal tract of animals. There has been a tendency, in most instances without adequate data, to include a number of these viruses in the enterovirus group. Several viruses, however, have been shown to possess the qualities of enteroviruses, such as mouse-poliomyelitis (Theiler's encephalomyelitis) virus and one recovered from normal swine by Betts (12) that produces central nervous system symptoms in colostrum-deprived pigs.

Table 4. Hemagglutination inhibition antibody titers of strain-specific guinea pig serum pools when tested with human and bovine strains of parainfluenza 3 virus from various parts of the United States, Canada, and other countries

Number of strains showing indicated pattern	Reciprocal of hemagglutination inhibition titer	
	HA-1 guinea pig serum pool	SF-4 guinea pig serum pool
Human:		
5-----	80	20
6-----	160	20
7-----	160	40
5-----	320	80
Bovine:		
1-----	40	320
4-----	20	160
1-----	<20	80
1-----	<20	40

Table 5. Virus isolation and serologic data on a 3-day-old Holstein calf inoculated intranasally with a human strain of type 2 reovirus

Days after inoculation specimen was obtained	Virus isolation results			Hemagglutination-inhibition antibody titers		
	Feces	Nose	Urine	T1	T2	T3
0-----	0	0	-----	<10	20	40
1-----	0	0	0	-----	-----	-----
2-----	0	0	-----	-----	-----	-----
3-----	0	0	-----	<10	20	40
4-----	0	0	+	-----	-----	-----
5-----	0	0	0	-----	-----	-----
6-----	+	0	0	<10	40	20
7-----	+	0	0	-----	-----	-----
8-----	+	+	-----	-----	-----	-----
9-----	+	0	-----	<10	80	20
10-----	0	0	0	-----	-----	-----
11-----	0	0	-----	-----	-----	-----
12-----	0	0	0	20	≥320	20
13-----	0	0	-----	-----	-----	-----
14-----	0	0	-----	-----	-----	-----
15-----	0	0	-----	10	160	<10
22-----	-----	-----	-----	10	160	<10
29-----	-----	-----	-----	<10	160	<10

In our laboratory, we have been conducting a study for the past 1½ years on the biology of the viruses recovered from the gastrointestinal tract of cattle. Some objectives of this work are (a) to study the seasonal prevalence of these viruses, (b) to investigate the lateral spread of these infections, and (c) to explore possible relationships of such organisms to those of man.

So far, we have only published studies on the reoviruses. The term "reovirus" was recently proposed (13) as a group name for a number of viruses formerly designated as being identical with, or related to, ECHO type 10. The reoviruses were removed from the ECHO group and placed in this new classification because they share a number of important biological properties, such as size and type of cytopathogenic effect in tissue culture, which distinguishes them from the other ECHO viruses. Rosen (14) has shown that the human and animal viruses which fit into this group can be segregated into three distinct serologic types, referred to as types 1, 2, and 3.

This group of viruses would appear to have a wide host range, having been recovered from cattle (15), mice (16), man, chimpanzees, and monkeys (13). There is also serologic evidence

of infection in rabbits, guinea pigs, different species of monkeys, horses, swine, cats, and dogs (17). No antibodies have been found in chickens or turkeys (14).

Reoviruses have been recovered from children with mild febrile illness (18), those with diarrhea, and a child with steatorrheic enteritis (13). In animals, one of the virus types was recovered from cases of rhinitis in chimpanzees and a similar type from the lung of a monkey dying of pneumonia (13). These viruses have been recovered in different parts of the world from uninoculated monkey kidney tissue cultures (19,20).

Only the recovery of type 3 reovirus from cattle has been reported in the literature (15); however, we have recovered all three types (unpublished data). Calves have been infected with all three human types. No signs of illness were observed, but, as shown in table 5, relative to type 2 reovirus, the virus was excreted in the feces and specific antibody was produced. While these experiments were being conducted, a 9-month-old Hereford calf was housed in the same barn. The calves received aerosols of various reovirus types outdoors so the Hereford calf never came in contact with the virus from

this source. Nevertheless this calf became infected with all three virus types (table 6).

The type 3 virus recovered from the naturally infected calves reacted in the hemagglutination inhibition test similarly to the human isolates.

No illness was observed in any of the calves from which we recovered these viruses, nor was any illness seen in experimentally infected calves. There is as yet no evidence whether cattle infect man or vice versa.

Conclusion

It has become increasingly evident that disease in man and animals represents only a small part of the total picture of infection. This would suggest that man and animals and many of their parasites have had a long history of "togetherness" in which an amiable relationship has been established. If this is so, then it would seem that infections by the parasites of man and animals would tend to stay within the same species rather than change long-established patterns of behavior. However, man may get into trouble when circumstances interject him into the midst of some of the animal infection cycles for which his past antibody experience would ill serve him or he would be exposed to groups of organisms which have no related counterparts in man; this latter possibility is illustrated by Q fever infections of man. Rickettsial infections, at least in this country, are not common. It would appear that infection of cattle and sheep with *Coxiella burnetii*, the causative agent of Q fever, is an innocuous event even though the organisms multiply in large numbers in the placenta and other organs. This infection of animals would have gone unnoticed had not man intruded into the environments of the animals and developed a very obvious, debilitating disease.

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Table 6. Serial hemagglutination inhibition antibody titers of a 9-month-old Hereford calf in contact with calves experimentally infected with human reoviruses

Date of serum (1958-59)	HI antibody titers		
	Type 1 ¹	Type 2 ²	Type 3 ³
10/31.....	<10	<10	<10
11/14.....	<10	<10	<10
11/21.....	<10	<10	<10
11/29.....	<10	<10	<10
12/5.....	40	<10	<10
12/11.....	40	<10	<10
1/19.....	80	<10	<10
2/6.....	80	<10	<10
2/13.....	80	<10	<10
2/20.....	160	10	<10
2/27.....	160	20	<10
3/6.....	160	10	<10
3/13.....	160	10	<10
3/22.....	160	20	20
4/27.....	40	10	10
5/17.....	40	20	10

¹ Contact inoculated 10/31.

² Contact inoculated 1/30.

³ Contact inoculated 2/28.

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Glaucoma Detection Program

In a new plan to speed up the detection of glaucoma in its early stages and thus to reduce the toll of blindness, the Public Health Service is distributing to all States and local health agencies conducting glaucoma detection programs questionnaires on the extent, methods, and results of the programs. The National Society for the Prevention of Blindness will make the questionnaires available to all its affiliates.

The Service will analyze the information and issue periodically summaries for the use of the health agencies.

In addition to indicating the actual prevalence of glaucoma in the United States, the plan is designed to provide the Service with complete and continuous information on glaucoma detection activities and will also give official and voluntary health agencies information on new methods of early detection of the disease.

Community Spread of Orally Administered Attenuated Poliovirus Vaccine Strains

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A STUDY of orally administered attenuated poliovirus vaccine was conducted in a small community in Minnesota in 1958. In that study (1), the feeding of virus to only half of the participating families during the first half of the study provided an opportunity to study the spread of these strains of poliovirus to participants who received placebos. Prior to this study, intrafamily (2-4) and intrainstitutional (5) spread of attenuated poliomyelitis vaccine viruses had been reported.

This study presents quantitative data on the community spread of vaccine strains of poliovirus. The design of the study, the vaccine strains used, the characteristics of the study population, the illnesses observed during the study, and the method of surveillance used to detect such illnesses were described in the earlier report (1).

All the authors except Dr. Johnson are with the Minnesota Department of Health. Dr. Kimball is chief, section of special laboratory studies; Dr. Barr is secretary and executive officer; Dr. Bauer is director, division of medical laboratories; Dr. Kleinman is chief, section of chronic diseases; and Miss Cooney is chief, section of virus and rickettsia diseases. Dr. Johnson is assistant professor, School of Public Health, University of Minnesota, Minneapolis.

This paper is one of a series. The study was aided by grants from the Elizabeth Kenny Foundation, Minneapolis, Minn., and the Lederle Laboratories Division of the American Cyanamid Co., Pearl River, N.Y.

The poliovirus vaccine strains used were developed by Dr. Herald R. Cox, director of viral and rickettsial research, Lederle Laboratories Division, American Cyanamid Co. In the report of the 1958 study, no harmful effects were attributed to the use of these strains. Since natural human passage might be expected to produce changes in some properties of these vaccine strains the need for intensive study of these passage strains is indicated. One important source of information on changes in vaccine strains is the medical histories of persons receiving these strains by natural spread. The medical records of these individuals are reviewed. If after several natural passages in humans the strains do not show a persistent and progressive increase in virulence for monkeys, their spread could have definite value. Not only would some immunity be acquired by individuals not fed the vaccine strains, but also the intermittent presence of these strains in a community could provide booster stimulation of previously vaccinated persons. The magnitude of interfamily or community spread of these strains can indicate the extent of added benefit that can be anticipated.

Materials and Methods

Participants in the study were married University of Minnesota students and their children. These families lived in Como Village, a crowded university housing development in Minneapolis. All 371 families in the village were invited to participate in the study and 149 families, 40 percent, volunteered.

The volunteers were divided into two groups of 74 and 75 families on a random basis. Family numbers were assigned alphabetically. Placebo was assigned to the first half of the families encountered in a random search of the random number tables. Thus members of 20 percent of the households in the village were fed vaccine (group B), and stool specimens were available from an additional 20 percent as controls for measuring the community spread of the vaccine strains. A map showing the distribution of vaccine and placebo fed households has been published (6). There were 545 persons in the 149 study families; 266 in group B, the vaccine-fed group, and 279 in group A, the placebo-fed, or control, group. Group B included 147 adults, 109 children, and 23 infants (under 1 year of age); group A, 141 adults, 95 children, and 30 infants.

During the study the identity of the two groups was known only to one member of the team. He made the random division and distributed the vaccine and the placebo capsules in envelopes labeled for each family. The sources of the blood serum and stool specimens were not known to the laboratory personnel.

The chronology and sequence of the feeding and collection of stool specimens are shown in the chart. Each participant submitted six stool specimens. The first specimens were collected prior to the feeding of vaccine to either group. The second, third, and fourth specimens were collected after type 2 virus had been fed to group B and before it was fed to group A; the third, fourth, and fifth specimens, after type 1 had been fed to group B and before it was fed to group A; and the fourth, fifth, and sixth specimens after type 3 had been fed to group B and before it was fed to group A. Thus three stool specimens were available to measure the community spread of each type of poliovirus, and this spread was measured for a period of about 8 weeks for each type.

The collection of stool specimens was scheduled for about 14 days after the feeding of virus. The elapsed time between feeding virus and collection of stool specimens was calculated from the Wednesday of the week the virus was fed. The median day of receipt of the second stool specimens was 14 days, of the third specimen 13 days, and of the fourth

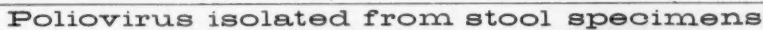
specimen 14 days, after each immediately preceding virus feeding. More than 93 percent of the specimens were received within 3 days prior to and 6 days following the median day of receipt. There was some overlap between the days for stool collection and the days for feeding virus (chart); however, no family was fed either the vaccine or the placebo until stool specimens had been submitted. The specimens were, in effect, the "ticket" for the vaccine or the placebo capsules. A few individuals who were away from home at the time scheduled for collection of stool specimens were continued in the study. Only 16 stool specimen results were missing; 15 expected stool specimens were not received and 1 specimen was unsatisfactory for isolation of virus.

Stool specimens were stored frozen (-20° C.) prior to processing. For isolation, 20 percent emulsions were prepared in distilled water by shaking for 5 minutes, centrifuging for 10 minutes at 1,500 rpm (International Equipment Co. No. 2) and 30 minutes at 13,000 rpm (Servall). A portion of the supernatant was diluted 1:2 with double strength Hanks' balanced salt solution (BSS) containing 600 units of penicillin and 600 μ g. of streptomycin per milliliter. Supernates of processed stool specimens were stored frozen and were thawed prior to inoculation, when 0.1 ml. of each processed specimen was inoculated into each of two HeLa cell tissue culture (TC) tubes. The procedure for preparation of the HeLa cell TC tubes was published in the earlier report (1).

Inoculated TC tubes were examined after 1, 3, 5, and 7 days of incubation at 37° C. When characteristic cytopathogenicity was observed after at least one transfer, the isolated virus was typed in the conventional manner. Cytopathogenic agents other than poliovirus were isolated from 16 specimens. These proved to be adenovirus type 1 or type 2. One hundred and forty-three selected stool specimens from which poliovirus had not been isolated on HeLa TC tubes were inoculated into monkey kidney TC tubes. No strains of ECHO virus were isolated.

Stool specimens from control group individuals from which types 1, 2, or 3 poliovirus had been isolated prior to the feeding of each respective type to those individuals were sent to

Study calendar



Dr. Cox for study of neurovirulence in monkeys. Intracerebral tests in monkeys showed no increase in paralytic ratio for any of the three poliovirus types when compared to virus-containing stools from vaccine fed individuals (7).

Evidence of community spread of vaccine strains to group A, the control group, was also shown by a significant rise (two tube, sixteen-fold) in antibody titer of the second blood specimen, collected at the middle of the study period, compared with the first blood specimen. Type 3 virus was fed to group B, the study group, from March 17 to 22, and second blood specimens were collected from March 31 to April 5. The elapsed time between feeding type 3 virus and collection of second blood specimens was, comparatively, much shorter than the elapsed time between feeding types 2 and 1 virus and the collection of blood specimens. For this reason virus spread, as measured by antibody response in group A, the control group, was not as fully measured for type 3 as for types 2 and 1.

It is also possible that the capacity for type 3 virus to spread to group A participants was not completely measured because the spread may have been reduced by feeding type 2 and type 1 vaccines to this group during the period of potential spread of type 3 vaccine (chart). The spread of type 3 vaccine strains may have been reduced by the feeding of type 2 and type 1 vaccines, which interfered with the spread of type 3, or the spread of type 3 may have occurred but was not measured if the fed vaccine strain replaced the naturally acquired type 3 virus.

During the study 16 infants were born, 5 to group A families and 11 to group B families. These newborns received the same vaccine or placebo capsules as their families were receiving even though they had missed earlier feedings. Forty-six stool specimens were received from the newborns, the number per infant varying from 0 to 5. Poliovirus was isolated from 11 specimens (type 2 from 1, type 1 from 5, and type 3 from 5), all collected after feeding of the virus. Results on the specimens from these newborns are not included in this paper.

Criteria used in evaluating the illnesses observed in group A, the placebo-fed individuals

who acquired the vaccine strains by natural passage, are presented with "Results." The medical followup was continuous and included numerous house visits (1).

The climate in Minneapolis is the humid continental type with a general tendency toward extremes. During the study period (January 27-June 6, 1958) maximum, minimum, and mean monthly temperatures were slightly higher than average, except in February, when they were slightly lower. Temperatures varied from -15° F. on February 16 to 88° F. on May 29. The climate was unusually dry, with normal precipitation only in April (8).

Results

The polioviruses isolated from stool specimens of group B, the vaccine-fed group, provide a rough measure of the viruses available for spread to group A, the control group. The percentage of isolations from each of the six stool specimen sets received from the vaccine-fed group is shown in the chart.

Poliovirus was not isolated from the first stool specimens collected prior to feeding vaccine. The second stool specimen, submitted approximately 2 weeks after type 2 virus had been fed, yielded type 2 virus in 8.8 percent of the adults, 38.5 percent of the children, and 60.9 percent of the infants. The third stool specimen, submitted after the feeding of type 1 virus, yielded type 1 virus in 12.9 percent of the adults, 61.5 percent of the children, and 87.0 percent of infants. Thus type 1 virus appears to have replaced type 2 in the intestinal tract of many of the recipients. However, five children were still excreting type 2 virus in the third stool specimen.

Three of these five children lacked detectable antibodies to all three types of poliovirus prior to receiving vaccine and developed antibodies against type 1 virus to a titer of 1:1,024 or greater following vaccine feeding. Two of the three children developed antibodies to type 2 virus, and one failed to develop antibodies against type 2 virus even though type 2 had been isolated from the third stool specimen. The remaining two children had antibodies to both types 1 and 2 virus prior to receiving

vaccine, and the titer rose sixteenfold or more to both types following feeding of vaccine.

The fourth stool specimen, submitted after feeding type 3 virus, yielded type 3 in 12.2 percent of the adults, 58.7 percent of the children, and 65.2 percent of the infants. Type 3 virus appears to have replaced type 1 in the intestinal tract of many vaccine recipients, but two adults, one child, and one infant were still excreting type 1 virus in the fourth stool specimen. One adult had type 3 antibodies in dilution 1:1,024 or greater prior to receiving vaccine, which may account for the suppression of the type 3 virus. The other adult was triple negative prior to receiving vaccine, and during the study responded serologically only to type 2 virus even though type 1 was also isolated from a stool specimen. The 13-month-old child was triple negative prior to vaccine and responded serologically to type 1 and weakly (titer 1:4) to type 3 vaccine but not to type 2. The 6-month-old infant was double negative with low titer (1:4) antibodies to type 2 virus and developed both type 1 and type 3 antibodies following vaccine even though only type 3 virus was isolated.

Type 3 virus was isolated from 60 of the fifth and 31 of the sixth stool specimens from group B individuals. The excretion of type 3 virus continued longest and thus was the largest source of virus "supply" for spread to the control group compared with the supply available for types 2 and 1.

Forty-five isolations of poliovirus were ob-

tained from specimens from 29 individuals in group A, the placebo-fed control group. The percentages of isolations from each of the six collections of stool specimens from this group are shown in the chart. Isolations due to community spread are shown as bars; isolations of types 2 and 1 from specimens submitted after these types of poliovirus had been fed to this group are shown as a tabulation at the bottom of the chart.

Poliovirus type 2 was isolated from the stools of two children and two adults in three group A families (table 1). The stool specimens were collected 12 to 15 days after the group B participants were fed type 2 virus. Two of the four persons were children in the same family (Nos. 4-3 and 4-4). Neither child had antibodies to type 2 virus detectable in the first blood specimen, but both showed a significant antibody response in the second blood specimen. Both adults had antibody titers to type 2 in the first blood specimen, and neither showed an increase in titer in the second blood specimen. Both adults had received Salk vaccine.

Four of the other five members of these three families had type 2 antibodies. In the fifth, a child of No. 105-2, no type 2 antibodies were detectable in serum dilution 1:4. There was no evidence that any of these five individuals had picked up type 2 poliovirus.

Poliovirus type 1 was isolated from 12 children in 7 group A families (table 2). Type 1 poliovirus was isolated from three children in family No. 29. The virus was first isolated

Table 1. Isolation of type 2 poliovirus and type 2 antibody results on four placebo-fed study participants

Family and person Nos.	Sex	Age	Number Salk vaccine inoculations	Stool specimens		Type 2 poliovirus antibody titer		
				Order No.	Number days ¹ since virus feeding	First	Second	Third
4-3	Female	34 mo	2	2d	14	<4	256	256
4-4	Female	4 mo	0	2d	13	<4	16	64
				3d	36			
12-1	Male	32 yr	1	2d	15	16	16	64
105-2	Female	20 yr	3	2d	12	64	64	1, 024

¹ Virus fed to vaccine group families Feb. 3-8, 1958. Number of days between feeding virus and collecting stool specimens, calculated from Feb. 5.

from the third stool specimen submitted from the 3-year-old (No. 29-3), and later from her and her two younger brothers. Type 1 poliovirus was isolated from four individuals in family No. 165. The virus was isolated earliest from the 8-month-old infant (No. 165-6), and later from her and her three older brothers. The remaining five type 1 isolations share several characteristics: they were all from children aged 2-5 years who had been fed type 2 virus; they were late isolations, being found only in the fifth stool specimens; they were collected within a 5-day period; types 1 and 2 poliovirus were isolated from all five specimens. None of these five children showed an antibody response to type 1 virus in the second blood specimen, which had been collected prior to the receipt of the fifth stool specimen.

In addition to the 12 children who picked up type 1 virus there were 18 other members in these 7 families. Eleven had type 1 antibodies

and only one, No. 47-1, the father of No. 47-4, showed an antibody response to type 1 in the second blood specimen. The other seven had no antibodies in dilution 1:4 against type 1 virus and showed no serologic response in the second blood specimen.

Poliovirus type 3 was isolated from 12 children and 1 adult in 8 group A families (table 3). Type 3 poliovirus was isolated from the fourth stool specimens of the adult (No. 157-1) and three children (Nos. 87-3, 144-3, 144-4), but only one of these four individuals (144-3) showed an antibody response in the second blood specimen. Type 3 poliovirus was first isolated from the fifth or sixth stool specimens from the remaining nine children; no antibody response was observed in the second blood specimens, which had been collected from these children prior to the time when they were shown to be excreting type 3 virus.

Besides the 13 persons who picked up type 3

Table 2. Isolation of type 1 poliovirus and type 1 antibody results on 12 placebo-fed individuals

Family and person Nos.	Sex	Age (years)	Number ¹ Salk vaccine inoculations	Stool specimens		Type 1 poliovirus antibody titer		
				Order No.	Number days ¹ since virus feeding	First	Second	Third
29-3-----	Female-----	3	3	{ 3d----- 4th----- 5th-----	{ 6 26 49	<4	16	64
29-4-----	Male-----	2	3	{ 4th----- 5th-----	{ 26 49	<4	64	256
29-5-----	Male-----	1	3	{ 4th----- 5th-----	{ 26 49	<4	4	256
165-3-----	Male-----	5½	3	{ 4th----- 5th ² -----	{ 25 44	4	4	64
165-4-----	Male-----	4	3	{ 4th-----	{ 26	4	16	256
165-5-----	Male-----	2	3	{ 4th----- 5th-----	{ 23 44	<4	256	1, 024
165-6-----	Female-----	8 mo.	3	{ 3d----- 4th----- 5th ² -----	{ 9 23 44	<4	4	256
27-3-----	Male-----	4	2	5th ³ -----	49	<4	<4	256
47-4-----	Male-----	2	2	5th ³ -----	53	<4	<4	1, 024
63-3-----	Female-----	5	3	5th ³ -----	50	<4	<4	<4
67-3-----	Female-----	2	3	5th ³ -----	50	<4	<4	16
103-3-----	Male-----	2	3	5th ³ -----	50	<4	<4	1, 024

¹ Type 1 poliovirus fed to vaccine group families February 24-March 1. Number of days between virus feeding and stool specimen collection calculated from February 26.

² Type 1 poliovirus also isolated from sixth stool specimen, but type 1 virus had been fed to the placebo group prior to collection of sixth specimen.

³ Types 1 and 2 poliovirus isolated; type 2 virus fed prior to collection of fifth stool specimen.

Table 3. Isolation of type 3 poliovirus and type 3 antibody results on 13 placebo-fed individuals

Family and person Nos.	Sex	Age (years)	Number Salk vaccine inoculations	Stool specimens		Type 3 poliovirus antibody titer		
				Order No.	Number days ¹ since virus feeding	First	Second	Third
41-3	Female	3	3	6th	48	<4	<4	16
41-4	Female	1	2	5th	25	4	<4	1, 024
45-5	Male	6 mo.	0	5th	27	<4	<4	<4
69-3	Female	2½	3	5th	29	<4	<4	16
69-4	Male	6 mo.	0	5th	28	<4	<4	64
72-3	Female	3	2	5th	27	<4	<4	256
72-4	Female	1½	0	6th	48			
87-3	Male	3½	2	4th	11	<4	<4	4
				5th	33			
92-3	Female	5	1	5th	26	<4	<4	64
92-4	Male	3	1	5th	27	<4	<4	16
				6th	53			
144-3	Male	2½	3	4th	7	<4	64	1, 024
				5th	26			
144-4	Male	11 mo.	2	4th	8	<4	<4	1, 024
				5th	25			
157-1	Male	27	3	4th	9	<4	<4	16
				5th	26			
				6th	47			

¹ Type 3 poliovirus had been fed to vaccine group families March 17-22. Number of days between virus feeding and stool specimen collection calculated from March 19.

Table 4. Serologic evidence of spread of poliovirus to control group A individuals, unconfirmed by virus isolation from stool specimens

Poliovirus type	Family and person Nos.	Sex	Age (years)	Number Salk vaccine inoculations	Antibody titer		
					First	Second	Third
2	5-3	Male	3½	3	16	256	1, 024
	43-1	Male	25	0	4	256	64
	56-1	Male	31	1	64	1, 024	256
	107-1	Male	25	3	16	256	256
1	¹ 47-1	Male	26	2	16	256	256
	² 144-1	Male	25	3	16	256	64
3	33-2	Female	26	3	64	1, 024	256
	¹ 47-1	Male	26	2	64	1, 024	256
	² 144-1	Male	25	3	4	64	64

¹ Type 1 poliovirus isolated from 1 child of 47-1.

² Type 3 poliovirus isolated from 2 children of 144-1.

poliovirus there were 21 additional persons in these 8 families. Eight had antibodies against type 3 poliovirus, and one of these (No. 144-1) showed an antibody response to type 3 (1:4 to 1:64) in the second blood specimen. The remaining 13 persons had no antibodies against type 3 poliovirus detectable in serum dilution 1:4, and no antibody response was observed in the second blood specimen.

Serologic evidence of community spread of the poliovirus vaccine, unconfirmed by virus isolation, was observed in seven persons. There were nine instances of poliovirus spread indicated by a rise in antibody titer; four for type 2, two for type 1, and three for type 3 (table 4). Types 1 and 3 poliovirus both appear to have been picked up by two male adults (Nos. 47-1 and 144-1). A child of No. 47-1 had also picked up type 1 but not type 3 (table 2), and two children of No. 144-1 had picked up type 3 but not type 1 (table 3).

The community spread of these poliovirus vaccine strains, whether supported by virus isolation, antibody response, or both, is shown in table 5. Among the 266 control group individuals, type 2 poliovirus had spread to 8, type 1 to 14, and type 3 to 16. These 38 instances of spread involved 36 individuals, 13.5 percent of the control group, distributed among 23 of the 74 control group families. Since the spread of two types of virus to one family was observed on only 2 occasions, this represents 11.3 percent of the total potential interfamily spread.

Poliovirus was not isolated from any adults or children with antibodies detectable in serum dilution 1:4 unless the individual was known to have received Salk vaccine. Virus isolation rates from stool specimens as a function of antibody status on the initial blood specimen and Salk vaccine experience is shown in table 6. Among the adults the majority, 63 percent or more, had poliomyelitis antibodies detectable in serum dilution 1:4 or greater in the initial specimen, but virus isolation was accomplished from few of these individuals compared with the isolation rates from those without antibodies. Furthermore, virus isolation from adults in the presence of serum antibody was limited to those who had had two or more doses of Salk vaccine, with one exception, and this individual had had one dose of Salk vaccine.

Among the children the majority had no detectable antibodies to types 1 and 3 poliovirus, and over one-third had no detectable antibodies to type 2. Virus isolation rates were high among children without poliomyelitis antibodies, regardless of their Salk vaccine status. These rates from children were significantly lower if poliovirus antibodies were demonstrable than if these antibodies were absent.

Virus isolation rates were high for infants, regardless of the presence of poliovirus antibodies in the initial blood specimen and regardless of their Salk vaccine status. In almost every instance the presence of poliovirus antibodies in the infant's serum appeared to be the result of placental transfer, as judged by the presence of the same type of antibody in the mother's serum and the extrapolated fall in titer as related to the age of the infant.

Evaluation of Symptoms

Study of the occurrence of symptoms of poliomyelitis in individuals to whom the virus had spread during the first half of the study revealed no illnesses which were attributable to the vaccine strains. For individuals to whom spread was proved by isolation of poliovirus the period 2 weeks prior to the collection of the stool specimen from which virus was first isolated and the 2 weeks following, or until type 2 virus was fed to group A, was classified as pertinent. During this pertinent period gastrointestinal disturbances were reported for one child and one adult; no other illnesses or symptoms were reported.

For persons with serologic evidence of spread, the time period for evaluation of occurrence of symptoms was from the date of feeding of the respective type of virus to group B, the vaccine group, to the date of feeding type 2 vaccine to group A. During this time one child and one adult reported gastrointestinal disturbances, one adult reported a respiratory illness, and one adult reported a respiratory illness and later a gastrointestinal disturbance. Additional members of the 23 families to whom the vaccine strains had spread reported essentially the same rates of respiratory illness and gastrointestinal disturbances as were observed in the study group as a whole (1).

In individuals with laboratory evidence of

spread, as well as in members of their families, the gastrointestinal disturbances occurred at the same time (March 9-22) as those observed for the entire study group.

Medical records are presented for the two families listed in table 2 in whom considerable intrafamily spread of the virus appears to have followed the entrance of type 1 vaccine strain into the household. The medical records for

family No. 165, two adults and four children, show no illnesses during the entire study period. In family No. 29, two adults and three children, both adults had a gastrointestinal disturbance in the middle of March; one child had a nasal discharge in late February and loose stools on 1 day in late March; one child had loose stools for 2 days in late March; the third child was well throughout the entire study period.

Table 5. Total spread of poliovirus vaccine strains to control group, as evidenced by isolation of virus, serologic response, or both

Persons involved	Total	Vaccine strains							
		Type 2		Type 1		Type 3		Total	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Families.....	74	7	9.5	8	10.5	10	13.4	25	¹ 11.2
Individuals.....	266	8	3.0	14	5.3	16	6.0	² 36	13.5
Adults.....	141	5	3.5	2	1.4	4	2.8	² 9	6.4
Children.....	95	2	2.1	11	11.6	9	9.5	22	23.2
Infants.....	30	1	3.3	1	3.3	3	10.0	5	16.7

¹ To give total interfamily spread, 100 percent = 74×3 , since each type could spread as a separate entity.

² 2 less than apparent total; evidence of spread of types 1 and 3 poliovirus to 2 adults reduces the person total.

Table 6. Virus isolation rates from stool specimens as a function of antibody status and Salk vaccine experience

Salk vaccine experience	Initial titer less than 4						Initial titer 4 or more					
	0-1 dose			2 or more doses			0-1 dose			2 or more doses		
	Number persons ¹	Virus isolations		Number persons ¹	Virus isolations		Number persons ¹	Virus isolations		Number persons ¹	Virus isolations	
		Num-ber ²	Per-cent		Num-ber ²	Per-cent		Num-ber ²	Per-cent		Num-ber ²	Per-cent
Adults:												
Type 1.....	29	12	41.4	41	13	31.7	46	0	0	166	8	4.8
Type 2.....	32	12	37.5	25	3	12.0	43	1	2.3	182	13	7.1
Type 3.....	39	8	20.5	65	15	23.1	36	0	0	141	3	2.1
Children:												
Type 1.....	16	14	87.5	119	86	72.3	1	0	0	65	28	43.1
Type 2.....	16	8	50.0	53	35	66.0	1	0	0	131	47	35.9
Type 3.....	17	7	41.2	146	72	49.3	0	0	0	38	3	7.9
Infants:												
Type 1.....	35	28	80.0	5	4	80.0	11	10	90.9	3	3	100.0
Type 2.....	30	22	73.3	5	3	60.0	16	12	75.0	3	1	33.3
Type 3.....	37	12	32.4	7	1	14.3	9	5	55.6	1	0	0
Total.....	251	123	49.1	466	232	49.8	163	28	17.2	730	106	14.5

¹ Total persons who had indicated prevaccine antibody titer and Salk vaccine experience.

² Persons from whom isolations were accomplished from at least one of the stool specimens.

Discussion

Using a time interval of about 3 weeks between feedings of the three types of poliovirus the number of virus isolations accomplished would seem to indicate that type 1 virus replaced type 2 and type 3 replaced type 1 very well (chart). The presence of one virus is usually expected to interfere with the establishment of another virus. However, since there was a time lapse of about 1 week between collection of the stool specimens and the feeding of another type of virus, replacement of the virus type is not proved but is strongly suggested by the evidence presented, and is a most striking phenomenon.

The continued excretion of type 3 poliovirus by group B individuals, as shown by isolation of virus from the fifth and sixth stool specimens, is in marked contrast to the small amount of continued excretion of types 2 and 1 poliovirus when followed by the feeding of another type. This long period of excretion may be a characteristic of the type 3 vaccine strain, and it is not known whether type 3 would have been well replaced if fed ahead of types 1 or 2. The possibility must also be considered that the long-continued excretion of type 3 was observed because no other virus was fed, and therefore there was less competition for "lebensraum."

The absence of "wild" poliovirus in this community was demonstrated by the absence of poliovirus in the stool specimens collected prior to feeding the vaccine strains and by the sequential appearance of each type of poliovirus only after each specific type had been fed. Since only 16 cytopathogenic agents (adenoviruses types 1 and 2) other than poliovirus were isolated during this study, the possible effect of enteric viruses other than poliovirus in interfering with the establishment of the vaccine strains of poliovirus has not been measured.

The number of isolations shown in the chart for group B, the vaccine-fed individuals, is not an accurate measure of all persons who excreted virus. The specimens were collected about 2 weeks after virus feeding, and it can be assumed that additional group B individuals excreted virus for shorter periods of time. This assumption is supported by the published results (1), which indicate that the proportion of individ-

uals showing antibody response for each virus type was larger than the proportion yielding virus in stool specimens collected 2 weeks after feeding virus. The value of the isolation rates shown in the chart is therefore limited to a comparison of the differences in amounts of virus of each type available for community spread rather than as a graphic representation of the total number of excretors in the community.

The difference in the amount of spread observed with the three types of poliovirus is probably related to the number of susceptible persons in the community (1). Considering susceptible persons as those without antibody to poliovirus, the smallest number were susceptible to type 2, and type 2 spread the least; the largest number were susceptible to type 3, and type 3 spread the most. As has been pointed out, we have reason to believe that the spread of type 3 was less completely measured in this study than was the spread of types 1 and 2.

The presence of antibodies in the first blood serum specimen does not always indicate protection against establishment of the vaccine strains in the intestinal tract (table 6). Several investigators have established that Salk vaccine is not effective in preventing multiplication of poliovirus in the intestinal tract. It also appears to be true that antibodies induced by Salk vaccine are not effective in preventing multiplication of the vaccine strains of poliovirus used in this study (table 6).

In the absence of detectable poliovirus antibodies, prior Salk experience does not markedly reduce the virus isolation rates in either adults or children. Differences between naturally acquired antibodies and antibodies induced by Salk vaccine cannot be determined, but it is logical to assume that poliovirus antibodies are natural in origin in adults more often than in children. On the basis of this assumption the differences in virus isolation rates observed in adults and children who have detectable antibodies and Salk vaccine experience are explainable (table 6, last column). If the poliovirus antibodies in the majority of the adults were natural in origin, the low rates of virus isolation which were obtained for the various types (2.1 to 7.1 percent) are to be expected; in a

larger proportion of the children showing antibodies these antibodies can be assumed to have been induced by Salk vaccine because the virus isolation rates are higher (7.9 to 43.1 percent).

Recently, Gelfand and co-workers have reported intrafamily (4) and community (9) spread of the attenuated poliovirus vaccine strains developed by Sabin. Spread of the vaccine strains was not observed when an attempt was made to observe long-continued interfamily spread (4). When experimental design maximized known factors which could be expected to facilitate interfamily spread of virus, only 30 percent of the contact children excreted virus (9). These results are basically similar to the very limited extent of community spread reported in this study.

The rate of spread of these vaccine strains of poliovirus can be expected to vary in different communities, and more spread could be expected in this community if a study were conducted during the summer months. There is a need to measure the rate of interfamily spread in a variety of community settings.

The findings reported in this paper suggest that the extent of spread will vary inversely with a community's prior experience with "wild" poliovirus. The immunity-producing potential of live attenuated poliovirus vaccine is such that one can expect that the spread of vaccine strains may also vary inversely with a community's prior experience with live attenuated poliovirus vaccine. It may be practical in the future to maintain immunity to poliomyelitis in a population by administering the oral vaccine to newborn infants and to the family of the infant. Study may later indicate that the feeding of the infants only may be effective in maintaining immune status for a community by the potential the infant has shown as a source of intrafamily spread which would supply booster exposure to the vaccine.

The modest rate of community spread of poliovirus vaccine strains observed in this study indicates that, beyond the households of vaccinees, the benefit of inadvertent immunization against poliomyelitis will be limited.

It is worth repeating that in this study a large proportion of the community participated; members of 20 percent of the households

were fed vaccine and an additional 20 percent were studied as contact families.

Summary

The interfamily spread of poliovirus vaccine strains was studied in a community of 371 households. Oral poliovirus vaccine was fed to 279 individuals in 75 families (group B), and placebos were fed to 266 individuals in 74 families (group A). The "supply" of virus available for spread was measured by virus isolations from group B. Spread to the control group (A) was measured by virus isolations and antibody response.

Poliovirus type 2 spread to 8 individuals in 7 families, type 1 to 14 individuals in 8 families, and type 3 to 16 individuals in 10 families. The variation in the rates of spread among the three types of virus appears to be related to the proportion of susceptible individuals rather than to any measurable variation in the potential for spread.

The 38 instances of virus spread involved 9 adults, 22 children and 5 infants, a total of 36 persons, or 13.5 percent of group A.

The 36 individuals were distributed among 23 of the 74 group A families; thus, one or more persons in one-third of the group A families were infected. Each family was usually infected by the natural spread of only one of the three types of virus; therefore, the observed spread represents 11.3 percent of the total potential interfamily or community spread.

These results indicate that the community spread of these poliovirus vaccine strains is markedly less than has been observed for intrafamily spread.

No illnesses attributable to infection with the vaccine strains were observed among the 36 individuals who acquired the poliovirus vaccine strains by natural interfamily spread.

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exhibits

SMOKING

Medical Research and Practice

Designed for professional audiences, this new exhibit attempts to distinguish those questions on smoking and lung cancer that are relevant to medical research and to medical practice. The exhibit reveals the investigator's concern for accurate methodology and the medical practitioner's concern for his patient's health.

The questions are based on three key, undisputed facts, which are presented on the center panel of the exhibit: (a) cigarette smoke injures the bronchial epithelium; (b) chemicals in cigarettes experimentally produce cancer in animals; and (c) mortality from lung cancer is higher in cigarette smokers than it is in nonsmokers.

A separate, pushbutton, question-and-answer panel poses seven im-



Specifications: (No. CC-6). A free-standing exhibit, about 7½ feet high and 13 feet wide, total weight 615 pounds including two packing crates. Lighting fixtures require two outlets with a total of 500 watts.

portant, universal questions for investigators and seven for practitioners. By pushing a button, the viewer lights up the answer to a question; each answer has been taken from authoritative statements which have appeared in the scientific literature.

Available on loan from the Cancer Control Branch, Division of Chronic Diseases, Public Health Service, Washington 25, D.C., the exhibit

should be requested several months before the date desired. The branch will pay all costs of shipping and installing at large national and regional meetings, but for smaller meetings of primarily local interest these costs must be borne by the borrower. Instructions for assembling the exhibit are attached to the inside door of each packing crate. It can be assembled by two men in 30 to 45 minutes.

1960 Summary of Disease Outbreaks and a 10-Year Résumé

CARL C. DAUER, M.D.

This is the 10th summary of foodborne and waterborne disease outbreaks prepared by the author. In addition to presenting data for 1960, it summarizes data collected during the decade 1951-60. The summary also reviews the reporting by individual States, compares reporting in the United States with that of England and Wales, and describes the general pattern of disease outbreaks in this period.

THE TOTAL NUMBER of outbreaks reported was considerably lower in 1960 than in 1959 or 1958 (table 1) principally because of a marked decrease in the categories of staphylococcal food poisoning and gastroenteritis, etiology unknown (table 2). It is not presumed that these decreases indicate significant progress in prevention of these foodborne diseases but rather that reporting was even more incomplete than usual in 1960.

Waterborne Outbreaks

The 11 waterborne disease outbreaks reported in 1960 included 2 small outbreaks of typhoid fever, 2 cases in one outbreak and 6 in the other; 3 of hepatitis; 2 of shigellosis or bacillary dysentery; and 3 of gastroenteritis. Only 1 of the 11 outbreaks was attributed to a public water supply. A large number of cases of shigellosis occurred after a breakdown in a town's water treatment plant. All other outbreaks were associated with the use of water from wells or springs.

Milkborne Outbreaks

Fluid milk was the vehicle of infection in only one of the five outbreaks reported. The other four were attributed to various milk prod-

ucts. In the instance involving fluid milk, five cases of staphylococcal food poisoning were traced to unpasteurized milk from a fresh cow. Many coagulase-positive staphylococci were isolated from a specimen of the cow's milk. Another outbreak of five cases followed consumption of ice cream made with unrefrigerated raw milk that had been obtained from one cow. There was no evidence of mastitis in the cow. In another instance, 10 cases of *Salmonella montevideo* infection followed the eating of homemade ice cream made with raw milk and a cracked egg found in a hen's nest. Five cases of gastroenteritis of undetermined etiology occurred in a family group who ate cottage cheese purchased from a store. The probable source of infection was not found.

Typhoid Fever

The four outbreaks of typhoid fever reported included one that was clearly waterborne, one that probably was waterborne, and two that were foodborne. In the first outbreak, six users of well water developed the disease. Investigation demonstrated that the well was contaminated by seepage from a septic tank used by a known carrier. In the other small outbreak the two persons affected lived in crowded, unhygienic surroundings and had used water from a well that was susceptible to contamination from a septic tank. A resident of the immediate area who used these sanitary facilities was found to be a typhoid carrier. One of the foodborne outbreaks occurred after a wedding reception where chicken salad sandwiches were served. One of

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the women who helped in the preparation of the chicken salad was a carrier. The preliminary report showed a total of 30 cases including one boy who did not attend the reception but presumably ate one of the sandwiches. The other foodborne outbreak occurred among 10 college students who ate in a college dining hall. A cook who worked in the kitchen was found to be carrying the same phage type of organism that was isolated from some of the patients. Investigation was hampered by the fact that the students developed symptoms after leaving the school for their summer vacations.

Salmonellosis

Seventeen outbreaks of salmonellosis were reported. One was considered milkborne, and the remainder were foodborne (table 3). Four of the outbreaks were associated with eating poultry meat, three with other meat, three with custard-filled desserts, and two with other foods. In four outbreaks the type of food was not definitely determined but they were considered to be *Salmonella* infections because specific types of organisms were recovered from affected persons. One of the outbreaks associated with custard-filled desserts was believed to have been caused by contamination of the food with rat droppings. In another instance, frozen whole eggs used in the preparation of cream puffs were thought to be the source of infection. One outbreak was reported in which a food-handler in a bakery had *Salmonella* diarrhea. He was believed to be the source of infection of the cream pie, eclairs, and cake eaten by members of several families who purchased the food. In a family outbreak of 10 cases after eating homemade ice cream made with raw milk and a cracked egg, *S. montevideo* was isolated from specimens of the ice cream and from stools of the patients.

Salmonella typhimurium was isolated in five outbreaks, *S. heidelberg* in four, and *S. enteritidis*, *S. manhattan*, *S. montevideo*, *S. newport*, and *S. oranienburg* in one each. The specific type was not reported in the three remaining outbreaks. The four isolations of *S. heidelberg* were made in one State while the five of *S. typhimurium* were made in widely scattered areas.

Table 1. Foodborne and waterborne disease outbreaks reported in 1960, by vehicle of infection¹

Area	Water		Milk and milk products		Other foods	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Total.....	11	1,784	5	48	182	7,434
New England:						
Maine.....					7	306
Massachusetts.....			1	20	8	201
Connecticut.....	1	23			1	220
Middle Atlantic:						
New York.....	4	1,511			18	1,442
New Jersey.....	1	63				
Pennsylvania.....					4	569
East North Central:						
Ohio.....	1	98			1	20
Indiana.....					2	29
Illinois.....	1	2	2	18	5	111
Michigan.....					2	10
Wisconsin.....					1	13
West North Central:						
Minnesota.....					6	283
Iowa.....					2	23
South Dakota.....					1	27
Nebraska.....					1	152
Kansas.....					1	76
South Atlantic:						
District of Columbia.....					1	46
Virginia.....					1	10
West Virginia.....	1	53			1	30
South Carolina.....					2	1,000
Florida.....					1	3
East South Central:						
Mississippi.....					2	40
West South Central:						
Louisiana.....					2	70
Texas.....					1	123
Mountain:						
Montana.....					1	36
Idaho.....					1	65
Colorado.....					4	73
Pacific:						
Washington.....			1	5	14	524
Oregon.....	1	6				
California.....	1	28	1	5	90	1,930
Alaska.....					1	2
United States, 1959.....	7	206	11	49	322	10,595
United States, 1958.....	4	445	13	441	236	9,925

¹ Includes outbreaks among military personnel.

Shigellosis

All outbreaks of shigellosis reported in 1960 were caused by *Shigella sonnei* infections. One waterborne outbreak following a breakdown in

Table 2. Foodborne and waterborne disease outbreaks reported in 1960, by type of infection¹

Area	Typhoid fever		Salmonellosis		Shigellosis		Hepatitis		Botulism		Staphylococcal food poisoning		Gastroenteritis, etiology unknown		Toxic agents		Other	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Total.....	4	48	17	629	7	2,256	4	108	4	7	54	2,088	89	2,874	11	93	8	1,163
New England:																		
Maine.....			2	156	1	52					1	2	2	94			² 1	2
Massachusetts.....			1	9							4	81	4	131				
Connecticut.....							1	23			1	220						
Middle Atlantic:																		
New York.....			3	160	3	2,015	1	21			4	253	10	501	1	3		
New Jersey.....													1	63				
Pennsylvania.....					1	105					3	464						
East North Central:																		
Ohio.....													1	98	1	20		
Indiana.....													2	29				
Illinois.....	1	2	1	10			1	11			2	22	2	42	1	44		
Michigan.....									1	1	1	9						
Wisconsin.....											1	13						
West North Central:																		
Minnesota.....									2	4	2	60	2	219				
Iowa.....											1	22					² 1	1
South Dakota.....											1	27						
Nebraska.....											1	152						
Kansas.....											1	76						
South Atlantic:																		
District of Columbia.....													1	46				
Virginia.....	1	10																
West Virginia.....							1	53			1	30						
South Carolina.....													1	46			² 1	954
Florida.....															1	3		
East South Central:																		
Mississippi.....			1	3							1	37						
West South Central:																		
Louisiana.....	1	30											1	40				
Texas.....													1	123				
Mountain:																		
Montana.....													1	36				
Idaho.....					1	65												
Colorado.....											3	53	1	20				
Pacific:																		
Washington.....											3	12	12	517				
Oregon.....	1	6																
California.....			9	291	1	19					23	555	47	869	7	23	⁴ 5	206
Alaska.....									1	2								
United States, 1959.....	5	43	19	1,428	6	228	1	160	10	24	89	4,138	182	4,285	14	74	9	592
United States, 1958.....	1	30	27	1,043	3	392			3	4	62	2,291	138	6,216	14	169		

¹ Includes outbreaks among military personnel.² Trichinosis.³ Alpha streptococcal infection.⁴ 1 *Bacillus cereus*, 2 *Clostridium perfringens*, 2 paracolon organisms.

the water treatment plant of a town was mentioned above. An estimated 1,400 cases occurred as a result of this failure. Another outbreak was traced to the water from a spring in a picnic area. Another rather large outbreak was reported in which the epidemiologic evidence pointed to some food eaten in a school

cafeteria. In another instance students who ate in a college dining hall became ill with diarrhea, which was confirmed as shigellosis by laboratory tests of specimens. *S. sonnei* was isolated from the stools of a cook who had gastroenteritis 5 days before the outbreak. In another outbreak, *S. sonnei* was also isolated

from a person who prepared potato salad for a buffet supper in a home.

Hepatitis

The total number of hepatitis cases, including both infectious hepatitis and serum hepatitis, reported in the United States increased from about 23,500 in 1959 to about 40,000 in 1960. There was also a relatively large increase in common-source outbreaks of the disease in which water or food was considered to be the vehicle of infection. Epidemiologic investigations indicated that three outbreaks could be classed as waterborne and one as foodborne. Two of the three waterborne outbreaks occurred among school children whose drinking wa-

ter at their schools came from wells. In each instance contamination of the wells with sewage was demonstrated. The other outbreak affected five different groups of persons who had picnics in a park where, it was stated, the water supply was inadequately chlorinated. Eleven students who had their meals in a college dining hall developed infectious hepatitis. Since one of the foodhandlers had been hospitalized with hepatitis about 3 weeks prior to onset in the students, this outbreak probably can be considered foodborne.

Botulism

Comparatively few cases of botulism were reported in 1960. Two were in native Alaskan

Table 3. Outbreaks of certain foodborne diseases reported in 1960, by type and source of food ¹

Source	Salmonellosis		Shigellosis		Staphylococcal food poisoning		Other ²		Gastroenteritis, etiology unknown	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
Type of food										
Poultry.....	4	350			8	682			18	374
Other meat.....	3	180			23	383	2	42	30	686
Fish.....									3	58
Custard-filled dessert.....	3	53			12	210			2	75
Salad.....			2	124	4	688			5	182
Other.....	2	12			4	100	3	1,071	10	92
Not determined.....	4	24	3	687			1	47	16	1,169
Total.....	16	619	5	811	51	2,063	6	1,160	84	2,636
Source of food										
Public eating establishments.....	6	84			9	95	1	17	29	791
Private clubs.....	1	6			1	18	1	100	5	308
Schools.....			1	570	4	689			3	92
Colleges.....			1	52	1	40			1	12
Hospitals and institutions.....					4	272			6	208
Labor camps.....									3	178
Social gatherings.....	4	320			10	695	1	47	13	639
Private homes.....	4	56	1	19	15	92			19	83
Transportation.....									2	32
Picnics.....					1	22	2	42	1	164
Other.....	1	153	1	105	6	140	1	954	2	129
Not stated.....			1	65						
Total.....	16	619	5	811	51	2,063	6	1,160	84	2,636

¹ Milkborne and waterborne outbreaks not included.

² Includes two outbreaks each due to *Clostridium perfringens* infections and paracolon organisms, and one each of *Bacillus cereus* infection and alpha streptococcal infection.

women who had eaten home-prepared salmon egg cheese. Frozen chicken pies were the suspected source of toxin for two cases, frozen ciscoes (fish) in two cases, and home-canned green beans in one case. Five of the seven cases reported were fatal.

Staphylococcal Food Poisoning

The 54 outbreaks of staphylococcal food poisoning reported in 1960 were considerably fewer than the 89 in 1959. Otherwise there appeared to be little change from reports for previous years. However, it may be noted that the number of cases per outbreak varied widely for the different types of food involved (table 3). For instance, 383 cases were reported in 23 outbreaks associated with the consumption of meat, while 688 cases in 4 outbreaks were traced to salads. The same disproportions were present for places where the food was served or prepared.

Gastroenteritis, Etiology Unknown

Only about half as many foodborne and waterborne outbreaks in which the etiology was not stated or determined were reported in 1960 compared with 1959. The average for the previous 4 years was 135. In more than half of the 1960 outbreaks the suspected vehicle of infection was poultry or other meat. The proportion caused by cream-filled foods was less than usual. About one-third were caused by food served in public eating establishments such as restaurants and hotels.

Chemical Poisoning and Noxious Foods

Four reports of chemical poisoning associated with the consumption of food or drink were received. In one, a weedkiller containing arsenic was accidentally introduced into the tank of a soft drink dispenser. One person became ill after eating peanut brittle that had been in contact with roach powder containing sodium fluoride. Seven persons became acutely ill after drinking punch that had been left overnight in a copper-lined receptacle. A drink concocted by a child caused the death of three playmates. An insecticide containing parathion

was believed to have been used in the mixture. Another episode might be classed as chemical poisoning. After eating hamburger meat to which sodium nicotinate had been added before its sale, 44 students noticed a flushing and itching of the skin.

Two small family outbreaks of mushroom poisoning were reported with no fatalities. Tung seeds caused severe gastroenteritis in three workmen who ate some of the nuts while unloading them from a ship. Members of a family complained of dizziness, blurred vision, nausea, and diarrhea after eating portions of the tree tobacco plant, *Nicotiana glauca*, which was mistaken for wild "greens." Only one report was received of poisoning from fish, in this instance smoked tuna.

Other Disease Outbreaks

In one of the outbreaks included in this category, *Bacillus cereus* was believed to be the probable etiological agent. Although various foods eaten by those affected were examined in the laboratory, only one, roast beef, yielded a culture of *B. cereus*. One of two outbreaks considered to be due to *Clostridium perfringens* was associated with consumption of roast beef. The other outbreak affected 100 picnickers who ate chile containing ground roast beef. Two outbreaks due to paracolon organisms affected 34 picnickers who ate meat sandwiches and 17 persons who ate Chinese food in a restaurant.

A large outbreak with 954 cases of an alpha streptococcal infection occurred on a military installation. Giblet gravy left unrefrigerated overnight was thought to be the vehicle of infection. The cook who prepared it had sore throat prior to the outbreak.

In contrast to previous years, only three epidemiologic reports of trichinosis cases were received in 1960. For this reason the disease is included under "Other" in table 2.

Summary of Disease Outbreaks, 1951-60

In the 10-year period ended in 1960 about 2,300 outbreaks were reported, 65, or about 3 percent, of which were waterborne. The total number of cases recorded was almost 100,000. The actual number of outbreaks and the average

annual number per million population for each State is shown in table 4 for two 5-year periods. The average number of outbreaks per million population was calculated for each State so that more valid comparisons could be made of the reporting in one State with that in another.

The average number of outbreaks per million population varied widely from State to State. In the 5-year period 1951-55 half of the States had an average of less than one outbreak per year and only 11 had an average of two or more. The figures for the second 5-year period show that only a few more outbreaks were reported than in the previous 5 years. There were more States with an annual average of less than one outbreak and only six States with

an average of two or more in this latter period. Twenty-one States reported fewer foodborne and waterborne outbreaks in the second 5-year period than in the first.

It cannot be assumed that States reporting the larger number of outbreaks per million population had inferior sanitary conditions in establishments which prepared or sold food products. They probably had higher rates because they encouraged and stimulated reporting and investigation to a greater degree than did the States with lower rates. It has been apparent for some time that certain large cities report no outbreaks and some report comparatively few. Many episodes are known to be investigated in some of these cities, but few are

Table 4. Number of foodborne and waterborne disease outbreaks reported and average annual number per million population, by State, 1951-55 and 1956-60

Area	1951-55		1956-60		Area	1951-55		1956-60	
	Total outbreaks reported	Average per million population	Total outbreaks reported	Average per million population		Total outbreaks reported	Average per million population	Total outbreaks reported	Average per million population
Total.....	1,066	1.4	1,274	1.5	South Atlantic—Con.				
New England:					North Carolina.....	15	0.7	11	0.5
Maine.....	12	3.4	36	7.6	South Carolina.....	1	.1	6	.5
New Hampshire.....	2	.8	3	1.0	Georgia.....	6	.3	12	.6
Vermont.....	2	1.1	3	1.6	Florida.....	12	.8	11	.5
Massachusetts.....	43	1.8	43	1.8	East South Central:				
Rhode Island.....	4	1.0	8	1.8	Kentucky.....	31	2.1	16	1.0
Connecticut.....	25	2.4	14	1.2	Tennessee.....	22	1.3	5	.3
Middle Atlantic:					Alabama.....	4	.3	5	.3
New York.....	237	3.0	99	1.2	Mississippi.....	6	.6	7	.7
New Jersey.....	3	.1	16	.6	West South Central:				
Pennsylvania.....	9	.1	13	.2	Arkansas.....	14	1.6	5	.5
East North Central:					Louisiana.....	8	.6	15	.9
Ohio.....	18	.4	38	.8	Oklahoma.....	3	.3	2	.2
Indiana.....	27	1.3	21	.9	Texas.....	10	.2	6	.1
Illinois.....	47	1.1	53	1.1	Mountain:				
Michigan.....	7	.2	13	.3	Montana.....	1	.3	2	.6
Wisconsin.....	13	.7	9	.5	Idaho.....	7	2.4	9	2.8
West North Central:					Wyoming.....	3	2.1	2	1.2
Minnesota.....	17	1.1	21	1.2	Colorado.....	7	1.0	13	1.6
Iowa.....	7	.5	8	.6	New Mexico.....	6	1.6	6	1.4
Missouri.....	14	.7	13	.6	Arizona.....	4	.9	3	.5
North Dakota.....	2	.6	3	.9	Utah.....	5	1.3	1	.2
South Dakota.....	3	.9	3	.9	Nevada.....	1	1.1	1	.7
Nebraska.....	1	.1	7	1.0	Pacific:				
Kansas.....	5	.5	2	.2	Washington.....	46	3.8	72	5.2
South Atlantic:					Oregon.....	37	4.6	25	2.8
Delaware.....	1	.6	0	0	California.....	273	4.6	553	7.2
Maryland.....	14	1.1	16	1.1	Alaska.....	2	2.5	3	3.7
District of Columbia.....	1	.2	5	1.2	Hawaii.....	8	3.4	4	1.1
Virginia.....	9	.6	17	.9	Noncontiguous:				
West Virginia.....	10	1.0	14	1.4	Puerto Rico.....	1	<.1	1	<.1

reported to State health authorities. It is also probable that many foodborne disease outbreaks occur, particularly family outbreaks, which never come to the attention of local authorities.

It has been variously and conservatively estimated that the actual number of foodborne and waterborne disease outbreaks is at least 10 to 20 times larger than the reported number. This means that the number of cases occurring annually is of the order of 100,000 to 200,000, a figure much greater than the approximately 10,000 presently reported.

Another method of evaluating the reporting in the United States is to compare its record with that of another country. A recent report on food poisoning in England and Wales (1) shows that the average annual number of "general outbreaks," which are defined as two or more cases in persons in different families, was 9.8 per million population during the 5-year period 1949-53. The rate for the United States, as shown in table 4, was 1.4 for the period 1951-55. The average annual rate was 10.6 in England and Wales for 1954-58 as compared with 1.5 for the United States in 1956-60. Not one of the United States had an average annual rate equal to that of England and Wales as a whole. While procedures for collecting information on foodborne disease and the method used to investigate outbreaks are different in the two countries, the differences in procedures probably do not explain the wide differences in numbers of episodes re-

ported in the two countries, nor may it be assumed that sanitary conditions in establishments manufacturing, processing, or preparing foods are much more inferior in the country with the higher rate. A more effective system of collecting information in England and Wales probably accounts for much of this wide difference in number of outbreaks.

Changes in Patterns of Infections

Table 5 shows the numbers of foodborne and waterborne disease outbreaks reported in the United States over a 9-year period by the principal etiological agents commonly reported to be the causes of such outbreaks. The sudden decrease in number of staphylococcal food poisoning outbreaks in 1957 and the concurrent increase in the number classified as gastroenteritis, etiology unknown, is due to a change in classification. Beginning in 1957, only those confirmed by laboratory examinations were placed in the category of staphylococcal food poisoning. "Suspect" outbreaks were included with gastroenteritis, etiology unknown, because the etiological agent was not determined or reported. In spite of this artificial decrease in number of reports of staphylococcal food poisoning there is no convincing evidence that this type is decreasing in frequency in the United States even though determined efforts have been made to improve food-handling procedures.

Likewise, there is no evidence of a decrease

Table 5. Outbreaks of foodborne and waterborne diseases reported from 1952-60, by type of infection

Year	Typhoid fever		Salmonellosis		Shigellosis		Botulism		Staphylococcal food poisoning		Gastroenteritis, etiology unknown	
	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases	Outbreaks	Cases
1960-----	4	49	16	619	7	2,256	4	7	53	2,088	89	2,874
1959-----	5	43	19	1,428	6	228	10	24	89	1,138	182	4,285
1958-----	1	30	27	1,043	3	392	3	4	62	2,291	134	6,216
1957-----	4	70	30	1,607	11	754	6	12	58	1,660	135	6,065
1956-----	7	52	23	1,999	8	1,107	11	22	111	4,313	88	6,688
1955-----	5	36	16	971	10	475	5	14	102	4,130	66	5,160
1954-----	16	92	26	1,164	19	1,471	8	18	100	4,868	103	5,914
1953-----	12	75	21	533	23	2,230	7	10	81	4,045	92	4,832
1952-----	11	156	31	1,335	12	1,441	2	5	77	3,798	50	2,049

in the amount of foodborne disease caused by *Salmonella* organisms. The wide distribution of the many types of this organism in many species of animals with which man has contact or may use as food makes it difficult to prevent transmission to man. The increasing use of chickens, turkeys, and ducks, and their eggs as food also contributes greatly to the incidence because these fowl are commonly infected with *Salmonella* organisms. In addition to the animal sources of infection, human carriers and patients have many opportunities to contaminate food.

Etiological agents not previously associated with foodborne infection or disease in the United States were demonstrated during the past decade. These included *C. perfringens* and *B. cereus*, which have been isolated in several outbreaks in recent years. The extent to which they contribute to foodborne disease in the United States has not been determined.

Since the early 1950's when hepatitis became reportable in all of the States, it has become apparent that the disease is one of high frequency and often occurs in localized epidemics. An increasing number of the epidemics in recent years have been waterborne according to evidence obtained in epidemiologic investigations. Foodborne hepatitis had been suspected but good epidemiologic evidence of such transmission or association with a specific food was not obtained until quite recently.

Need for More Complete Reporting

A lack of enthusiasm regarding any attempt to improve the reporting of foodborne and waterborne disease is readily apparent in some parts of the United States. Several factors may contribute to this attitude. One possibility is that the volume of reported illness has been relatively small. There is also a general impression that infectious diseases are no longer an important public health problem and that other disease problems are paramount. This impression may have been formed because of the remarkable decline in waterborne outbreaks

of typhoid fever, dysentery, and some other enteric infections and the virtual disappearance of milkborne epidemics of diphtheria, streptococcal sore throat, and typhoid fever. Also some of the infectious diseases have been brought under control, the severe effects of others have been counteracted by chemotherapy, and a few, such as measles, whooping cough, and streptococcal infections, have declined in severity.

On the other hand, there is good reason to believe that foodborne diseases and, to a lesser extent, waterborne diseases, are still widely prevalent; neither can be measured in terms of reported incidence. Consequently, it can be argued persuasively that there is a real need to improve the reporting of both waterborne and foodborne illness as the first step in the development of effective control measures. There also is real need to study more intensively and extensively the epidemiology of staphylococcal food poisoning and *Salmonella* infections because their causative agents are widely distributed and their ecologic factors are complex. The relationship of the many phage types of staphylococci which cause septic infections to foodborne illness needs to be determined more accurately, and the ecology of the hundreds of salmonellae serotypes found in man and animals needs more extensive study. The relative importance and frequency of illness due to etiological agents not previously associated with foodborne disease in the United States should be determined. The increasing frequency of common-source epidemics of infectious hepatitis reported recently suggests the need for more careful investigation of their epidemiologic factors. The lack of information on these aspects of foodborne and waterborne diseases is ample justification for making more thorough epidemiologic and microbiological investigations and for more complete reporting.

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Employment Outlook for the Handicapped

Ewan Clague, Ph.D.

IF THE WORD "handicap" is defined broadly to include any limitations on normal physical and mental health, then nearly all of us have some handicap.

In the U.S. National Health Survey in 1957-59, the Public Health Service found that more than 40 percent of the American population were suffering from one or more chronic conditions of illness, while a total of 10 percent of the entire population had some degree of activity limitation because of these chronic conditions. Furthermore, while the figures for young people under the age of 25 showed chronic conditions in only 21 percent of that age group, the figure for age 45-64 was nearly 60 percent, and for 65 years of age and over it was about 77 percent. This survey shows that a degree of activity limitation amounted to more than 16 percent in the group aged 45-64 years and more than 42 percent in the group 65 years and over.

It appears that in our current population there may be nearly 11 million people who might experience employment handicaps because of their physical condition.

Furthermore, the figures above do not include persons injured in various ways. Statistics from the survey showed that nearly one-fourth of the U.S. population suffered some kind of accident during a 2-year period, counting accidents at home, at work, in motor vehicles, or in other ways. Of course, many of these accidents were so minor that they may have had a purely temporary effect upon a person's health or working ability.

Dr. Clague is commissioner of labor statistics, U.S. Department of Labor. This statement is based on a talk given before conferees on Heuristic Hypotheses About the Variant Child in Our Culture, at the Woods School, Langhorne, Pa., May 17, 1961.

However, it has been estimated by the Bureau of Labor Statistics that in the past 5 years (1956-60), an average of approximately 82,000 persons have experienced permanently disabling work injuries in each year. In our present population of working age, therefore, there are about 1.5 million people who have permanent physical impairments of some degree arising from their employment. Many of these, of course, are minor impairments and have little or no effect upon employability. But the existence of these impairments must be taken into account in some degree in placement of these persons in jobs.

Since so many of us are impaired or partially disabled in some form or other, and in some degree or other, many of us must be doing quite well despite our handicaps. The significant point here is that while a handicap may operate to limit or circumscribe one's opportunities, it may be no disadvantage at all in other directions. In fact, as in the case of a deaf person in a noisy factory, it may be a positive advantage. So, too, a person almost completely disabled for heavy physical work may be well qualified for certain kinds of desk work in an office.

So far, mental handicaps have not been mentioned. These are found in many different forms. Little is known about the adaptation of mental handicaps to job opportunities, but it is at least possible to infer that there are possibilities of finding job opportunities in which the mental handicap is of minor importance or even nonexistent.

The changing pattern of American industry has many profound implications for handicapped persons.

Based upon statistical projections by the U.S. Department of Labor for the decade of the 1960's, we expect a more rapid increase in

the Nation's labor force, both men and women, both old and young, in the 1960's than we have had since World War II. This means that jobs in general may be somewhat harder to find than they have been within the recent experience.

Second, a gradual upward trend is indicated in the more highly skilled occupations. For example, the occupational group showing the fastest growth at the present time is the professional and technical group. This includes not only the professions, but also the sub-professions and the technicians who support them. It is estimated that this group may increase as much as 40 percent within the next 10 years. Likewise, we foresee substantial increases in white-collar occupations generally, in clerical and sales occupations especially, as well as in the skilled trades and in managerial and administrative occupations. Conversely, we foresee an actual decline in farming occupations, both farmers and farm laborers. Nor is there any increase in sight in the unskilled labor occupations in industry. Even in many of the service occupations associated with the growth of the population, such as hotel and restaurant employees, barbers and hairdressers, or recreational workers, we do not foresee rapid growth.

This prospective shift in the Nation's occupational structure bears heavily upon plans for education and training. There has been a steady increase in the degree of education acquired by successive generations of American workers. More youngsters are going to high school, more are graduating from high school, more are going to college, and more are doing graduate work. The average educational level is increasing.

Nevertheless, the shift in occupational needs may be occurring faster than the educational advances. We have estimated that about 26 million new young workers will enter the labor force in the 1960's. Among them there are likely to be about 30 percent who will have only a grade school education or a few years of high school. In the light of the educational requirements for professional, technical, managerial, skilled, and clerical jobs, it is a question of whether these under-educated workers

will qualify for jobs in those fields. On the other hand, the outlook for unskilled and common labor jobs, including unskilled service jobs, portends a declining labor market for uneducated and untrained youngsters. They may have trouble finding job opportunities, and they may have additional trouble in holding jobs which they do obtain.

We have already seen some evidence of this in the studies conducted by the Bureau of Labor Statistics on high school dropouts in seven communities. In summary, they indicate the sharpest kinds of contrast between those who graduated from high school and those who dropped out without graduating.

Nearly half of the boy graduates were in skilled or semiskilled jobs as compared with about a third of the boy dropouts. Only 3 percent of the boy graduates were earning less than \$40 a week compared with 15 percent of the dropouts. Approximately one-third of the boy graduates were earning \$80 or more a week compared with about one-fifth of the boy dropouts.

About two-thirds of the girl graduates found jobs in offices while the majority of girl dropouts found jobs as waitresses or engaged in other unskilled work. Half of the girl graduates were earning \$50 or more a week compared with about one-sixth of the girl dropouts.

Graduates and dropouts experienced sharply different amounts of unemployment. Dropouts had two to three times the amount of unemployment as graduates. This was true of both boys and girls.

Summary

There is a rising trend in jobs that require education and training. At the same time, the shift of white-collar and office jobs may enhance the chances for physically handicapped persons to earn a living. Handicapped persons of most kinds, and in practically all degrees, can be successfully employed, even though the range of their abilities is narrow. It is most important to understand the importance of schooling as a factor in preparing young people, whether handicapped or not, for successful employment in accordance with their abilities, physical and mental.

Progress in Reporting Mental Hospital Statistics

*Eleventh Annual Conference of
Mental Hospital Statisticians
New Orleans, La., May 23-26, 1961*

CONSIDERABLE progress has been achieved in the development of uniform, meaningful data reflecting the movement of patients through mental hospitals. However, these data raise many questions about the relationship between the mental hospital and the community it serves. The existence of other types of psychiatric facilities in the community and the function they perform exert considerable influence on the number and characteristics of patients admitted to mental hospitals, the rate at which patients are subsequently released from the hospitals, and the rate at which patients are able to remain in the community following release from the hospital. Thus, it seemed appropriate that the Model Reporting Area for Mental Hospital Statistics take stock of these developments and consider the means by which they can be taken into account in analyzing the mental hospital in relation to the total pattern of psychiatric care in the community.

Consequently, a primary concern of the Eleventh Annual Conference of Mental Hospital Statisticians was to consider the direction the Model Reporting Area should take in light of the changes occurring in the patterns of care of the mentally ill. The conference, held May 23-26, 1961, in New Orleans, La., was attended by representatives of the 26 member States (see box insert) and observers from 5 other States, Veterans Administration, American Psychiatric Association, Saint Elizabeths Hospital, Washington, D.C., and the Dominion of Canada.

A report submitted by the advisory committee, which was appointed at the Tenth Annual Conference to review the activities of

the Model Reporting Area and to suggest its future course, served to focus the discussion on this matter. This report recommended that the Model Reporting Area should assume the following major functions:

1. Maintain and improve reporting on public mental hospitals.
2. Extend and improve statistical reporting on (a) inpatient psychiatric facilities other than public mental hospitals, (b) outpatient psychiatric facilities, (c) all other psychiatric diagnostic and treatment programs.
3. Foster and coordinate cooperative studies.
4. Develop methodology for intrastate studies.
5. Assist in strengthening statistical bureaus through the improvement and clarification of their role in the State mental health program.

Reporting on Public Mental Hospitals

It was the general consensus of committee members as well as conference participants that, for the present, the primary focus of the Model Reporting Area should remain on reporting and analysis of data for public mental hospitals because (a) many aspects of the effect of patient care in these hospitals remain unexplored, (b) current definitions of terms describing movement of patients need further refinement, and (c) new definitions need to be developed.

Furthermore, nonmember States need encouragement to develop statistical reporting for their hospital systems to the point where they can qualify for membership in the Model Reporting Area. The requirements for member-

ship are the establishment of a central statistical unit, headed by a qualified person, capable of receiving and processing individual patient reports from each public mental hospital in the State; adoption of basic definitions agreed to by members of the Model Reporting Area; and preparation of basic uniform statistical reports each year.

Most conference participants acknowledged the importance of also having data on extra-mural programs which would show the services patients receive after leaving the hospital and the adjustments they make. However, there was general agreement that the present personnel shortages and lack of sufficient financial resources make it almost impossible for most State statistical bureaus to produce tabulations in addition to those now required for Federal, State, and local purposes.

Several means of alleviating the current shortage of resources and personnel were suggested. These included an exploration of the possibility of some form of Federal aid to the States for financing national reporting, on-the-job training supplemented by special courses in public health statistics for staff personnel at the lower level, and more intensive recruiting efforts.

Reporting for Other Psychiatric Facilities

There was general agreement that the increasing number and variety of psychiatric facilities in the community exert considerable influence on the public mental hospital by

stimulating or preventing admissions and facilitating releases. The interaction of these efforts can result in a change in the characteristics of patients admitted to and resident in the public mental hospitals. The conference recommended as a long-range goal the development of a Model Reporting Area which would include, as a minimum, reporting on both public mental hospitals and outpatient psychiatric clinics. This would require a close liaison between the present Model Reporting Area and the recently organized advisory committee for national reporting of outpatient psychiatric clinics to formulate a set of standards for outpatient clinic reporting parallel to those for inpatient reporting. These standards would constitute the criteria for admission to an expanded Model Reporting Area.

Community Mental Health Programs

One full session of the conference was devoted to a presentation and discussion of the mental hospital within the perspective of the community's entire mental health program. Among the developments in this area occurring in various parts of the country is a psychiatric case register, now in operation in an upstate New York county, which provides complete reporting on all new and reopened cases from all inpatient and outpatient facilities and private psychiatrists within the county. The information obtained on patients each time they are admitted to a psychiatric service consists of name, basic demographic data, type of past psychiatric service, diagnostic classification, type of service received, type and duration of treatment, and condition on discharge or termination.

With these data it may well be possible to (a) obtain some knowledge about the rate at which persons from population groups having different characteristics come under care in a variety of diverse treatment situations, (b) determine the long-range pattern of utilization of the psychiatric services within a community as an aid to future planning, (c) devise some measure of the ultimate success or failure of different therapeutic approaches for major diagnostic groupings of patients having specific demographic and socioeconomic characteristics, and

Model Reporting Area States

Representatives from the following States are members of the Model Reporting Area for Mental Hospital Statistics.

Arkansas	Maryland	Oregon
California	Michigan	Pennsylvania
Connecticut	Minnesota	South Carolina
Idaho	Nebraska	Tennessee
Illinois	New Jersey	Texas
Indiana	New York	Virginia
Kansas	North Carolina	Washington
Kentucky	Ohio	Wisconsin
Louisiana	Oklahoma	

(d) develop some test of the reliability of current diagnostic terminology by ascertaining whether or not certain diagnostic groups are used interchangeably by different psychiatrists treating the same patient within a short period of time.

A similar psychiatric case register was established for the State of Maryland beginning July 1, 1961. The Maryland register, under the joint auspices of the National Institute of Mental Health, Public Health Service, and the Maryland Department of Mental Hygiene and Department of Health, will obtain, on a continuing basis, basic information, including name, on all Maryland residents admitted to and separated from every inpatient and outpatient psychiatric facility in Maryland and those in the District of Columbia which admit residents of Maryland. Patients seen by private psychiatrists will not be included in the register at present, but steps are being taken to enlist eventually the cooperation of the private psychiatrists. This register will provide a longitudinal record of the psychiatric services obtained by a single person and an unduplicated count of the number of persons receiving psychiatric service in clinics and hospitals. It will also facilitate studies of the effectiveness of various types of services for different categories of patients with respect to age, sex, diagnosis, and other characteristics.

Important among the numerous problems encountered by States desiring to set up some type of psychiatric case register are (a) coordinating inpatient and outpatient statistical reporting, particularly in those States or areas where inpatient and outpatient facilities are operated under two different departments; (b) enlisting the cooperation of private psychiatric facilities and private psychiatrists who ordinarily are not obligated to report information on specific patients to a central statistical bureau; and (c) obtaining agreement from the various facilities, particularly those which are privately supported, to identify patients by name.

The manner in which such problems as these are approached and solved in the two register projects will serve as an invaluable guide to those States or areas which are contemplating an expansion in the reporting of their psychiatric care programs.

Aftercare Programs

In line with the Model Reporting Area's long-range objective of examining the influence of extrahospital psychiatric facilities on mental hospital populations, the conference devoted considerable discussion to the evaluation of various programs of care affecting the patient after release.

To focus the discussion, conference participants were presented with a set of proposed steps for evaluating aftercare programs which consisted of (a) listing the stated goals of the program, (b) conducting studies to determine the extent to which the stated goals are being achieved in terms of number and characteristics of patients served, services received, and outcome, and (c) developing indexes to measure the extent to which these goals are being achieved. Also discussed was the desirability of national (state-by-state) data on aftercare programs in order to provide a body of data useful to the development of new aftercare programs and to permit interstate comparisons of the activities of such programs.

There was a general consensus that evaluation of aftercare programs would be difficult at present owing to the rapidity with which new programs are coming into being and the wide intra-state and interstate variations in these programs and their goals. Consequently, the immediate prospects of standardizing the statistics collected on such programs in order to obtain meaningful national data and to facilitate interstate comparisons were not considered encouraging. It was generally agreed that, for the present, it would be more important to try to establish a routine reporting system for these programs which would provide some measure of the extent of their activity and an assessment of their effect upon the rate of return of patients to the mental hospital. Several member States indicated a willingness to pursue this objective either individually or on a cooperative basis.

Report of the Joint Commission

The Joint Commission on Mental Illness and Health in its report "Action for Mental Health" (1) recommended a number of changes in the pattern of care and treatment of the mentally

ill. Foremost among these were that new mental hospitals being built should be limited in size to 1,000 beds, that existing large mental hospitals be converted into centers for the care and treatment of the chronically ill, including those with chronic mental illness, and that various types of intensive treatment centers and programs of care be established outside the mental hospital.

Implementation of these recommendations would considerably affect mental hospital populations and consequently have important implications for the data collection and analysis activities of the Model Reporting Area. Although some States appear to have programs either in the planning stage or already established which closely parallel some of those recommended by the joint commission, most conference participants indicated that reaction to the joint commission report had not yet created a demand for additional data. In recognition of the fact that the mental hospital statistician may assume an important role in program planning based on some of the joint commission's recommendations, conference participants were urged to become familiar with this report.

It was generally agreed that the Model Reporting Area, in view of long-range objectives, will need to keep abreast of the developments which result from the joint commission report.

Regional Meetings

Annual regional conferences of mental hospital statisticians have developed spontaneously in two regions, the midwest and the south, as an outgrowth of the Model Reporting Area activities. Each group has discussed intensively topics of particular interest within the region.

The agenda of the Sixth Midwest Conference on Health Statistics held in Columbus, Ohio, in October 1960, included discussions on the following items:

- The role of the medical records librarian and the medical records consultant in the mental hospital.

- Inconsistencies in diagnostic classifications, particularly with respect to alcoholism.

- Development and improvement of statistical reporting for inpatient psychiatric services for children, day-care and night-care hospitals, outpatient psychiatric clinics, and other psychiatric care programs.

- Status of statistical reporting on epileptics in light of the new classifications for mental retardation.

- Special treatment programs such as the use of public health nurses to provide followup care for patients released from mental hospitals.

- The compilation and use of data on patients on waiting lists of institutions for the mentally retarded.

The Southern Regional Conference on Mental Health Statistics, which met in Atlanta, Ga., in November 1960, is carrying out its broad objectives of improving the caliber of statistical reporting and fostering the cooperative interchange of data and ideas among its member States. The conference sponsored, with the cooperation of the Southern Regional Education Board and the National Institute of Mental Health, a 2-week training institute in basic mental health statistics. The institute, held at the University of North Carolina, Chapel Hill, August 7-18, 1961, was attended by mental hospital statisticians and mental health clinic statisticians in the southern region. Representatives from other regions were also invited to attend in order to stimulate the development of similar institutes in other parts of the country.

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Treatment of Early Syphilis with Erythromycin

ASTON B. GREAVES, M.D.

WITH THE INCREASE in reactions to penicillin (1,2) the necessity for evaluating other antibiotics in syphilotherapy has become compelling. Among the newer and more promising antibacterial substances being assayed as penicillin substitutes are erythromycin, carbomycin (Magnamycin), and chloramphenicol (3-10).

An investigation of these antibiotics in the treatment of syphilis was conducted by the venereal disease control program of the District of Columbia Department of Public Health, under the supervision of the Venereal Disease Branch of the Public Health Service Communicable Disease Center. Our contribution to this research was the treatment of 29 early syphilis patients with a total dosage of 10 gm. of propionyl erythromycin (4).

Materials and Methods

Primary and secondary syphilitic patients attending the Northwest Central Clinic, Venereal Disease Control Program, District of Columbia Department of Public Health, were selected for this project. All had lesions dark-field positive for *Treponema pallidum*. Willingness to cooperate, basic intelligence, and stability of residence were the other deciding factors in choosing patients for the project. Those judged acceptable were immediately

Dr. Greaves is supervisory medical officer, venereal disease control program, District of Columbia Department of Public Health. Edward A. Thompson served as investigator for the project.

given an initial dose of 2 gm. of propionyl erythromycin orally in the clinic followed by 1 capsule (250 mg.) three times a day at each meal and at bedtime for 6 days and an additional 2 gm. in the clinic on the eighth day. This schedule insured that at least 4 gm. of the medication was taken under supervision. Dark-field examinations were repeated when the patients made their first return visit. Blood was drawn for serologic tests for syphilis each month for 6 months after treatment, then on the 9th and 12th months. The genitalia, skin, mucosa, and anus were inspected each time blood was taken. The blood specimens were mailed directly to the Public Health Service Venereal Disease Research Laboratory at Chamblee, Ga., where VDRL, KRP, FTA, and tpcf-50 tests were performed on each specimen. A spinal fluid examination was made at the 12th month after treatment, or at the time of serologic or clinical relapse.

Results

Fifteen of the 29 patients in the study experienced no discomfort from treatment with propionyl erythromycin. Drug intolerance, when present, was referable to the gastrointestinal tract. Symptoms included diarrhea, nausea, and abdominal pain, occurring singly or in various combinations.

Repeat dark-field examinations were negative in most patients on the third or fourth day after treatment. However, *T. pallidum* disappeared from the lesions of four patients 2 days after therapy was instituted.

Of the original 29 patients, 5 proved to be recalcitrant and were lost from the project. Three of the remaining 24 were treatment failures and four were reinfections.

Treatment Failures

Case 1 was diagnosed secondary syphilis with a chancre of the right labia majora and maculopapular syphilides involving the palms and soles on April 22, 1959. Dark-field examination from the labial lesion was positive. Pretreatment VDRL test was reactive to a dilution of 32. The patient's titer decreased to 4 dils 2 months after therapy and then rose to 16 dils the following month. Examination at that time revealed dark-field positive moist lesions of the vulva.

Case 2 presented a chancre of the prepuce with syphilitic alopecia and maculopapular syphilides of the palms, soles, and scrotum on April 6, 1959. His initial serologic test was reactive to a dilution of 32. On May 6, 1959, there was a reappearance of the former lesions, in addition to new lesions of the upper and lower extremities and the scrotum. On that same date the VDRL test was reactive 1:16.

Case 3 exhibited a chancre of the prepuce, palmar and plantar syphilides, and condyloma

lata of the prepuce and penis. His pretreatment serologic test was 16 dils on August 14, 1959. Two months later his titer decreased to 2 dils and then rose to 8 and 16 dils on November 17 and December 14, respectively. Physical examination on December 14 disclosed a reappearance of annular lesions of the scrotum.

Reinfections

Case 4 was diagnosed secondary syphilis on March 19, 1959. A dark-field positive chancre of the perianal area, patchy alopecia, thinning of the eyebrows, and palmar and facial syphilides were discovered. His blood serum was reactive to a dilution of 128. His titer decreased to a dilution of 1 on July 19 and August 20 but rose to 4 dils on September 21. Examination at this time revealed a chancre of a hemorrhoidal skin tag.

Case 5 presented dual chancres of the prepuce on April 22, 1959. His pretreatment titer was 16 dils. He became seronegative on June 24 and remained so until October 21, when he developed a new lesion of the coronal sulcus. He was designated "contact to secondary syphilis."

Case 6 had a verified history of treatment for early syphilis. He was diagnosed "reinfection, secondary syphilis" on July 6, 1959, on the basis of moist lesions of the perianal area and papular syphilides of the palms and soles. His titer was 8 dils. On January 1, 1960, his titer dropped to 1 dil, rose to 2 dils on April 6, and was 8 dils on October 7. Examination on the last date revealed moist lesions of the perianal area.

Case 7 presented moist lesions of the vulva and maculopapular syphilides of the palms and face. Dark-field examination was positive. Her pretreatment titer was 32 dils on March 26, 1959. She became seronegative on July 28. On October 9 her titer rose to 8 dils. She was diagnosed as secondary syphilis in November 1959 at District of Columbia General Hospital, where she went for obstetrical care. A serologic test then was reactive 1:16. She delivered a syphilitic baby on November 13. A serologic test of the infant in December 1959 was 256 dils, and tests on January 5 and January 7, 1960, were 128 and 256 dils respectively. X-ray of the infant's long bones demonstrated syphilitic periostitis.

Patients who were treatment failures and

Post-treatment results of VDRL test in early syphilis patients treated with erythromycin

Stage of syphilis	Pretreatment serology	Post-treatment results of VDRL test, in dilutions			
		3 months	6 months	9 months	12 months
Secondary	64	4	1	1	1
	32	4	2	2	2
	32	2	1	1	1
	32	1	WR-0	WR	N
	16	2	1	2	1
	16	1	WR	WR	WR
	16	N	WR-0	WR-0	N
	8	16	8	4	2
Primary	32	N	N	N	N
	16	4	1	2	1
	16	N	N	N	N
	4	WR-0	WR-0	N	N
	4	4	2	2	2
	1	1	1	WR-0	N
	1	N	N	N	N
	WR-0	N	N	N	N
	N	WR-0	N	N	N

NOTE: WR—weakly reactive; WR-0—weakly reactive to negative; N—negative.

reinfecting patients were re-treated with penicillin therapy whenever practicable. The failure rate was 3 in 20 cases, or 15 percent. Seventeen patients completed the 1-year observation period.

The effectiveness of erythromycin against *T. pallidum* has previously been reported (11,12). However, prolonged clinical and serologic observations are essential before final appraisal of any therapeutic agent is made. The results of the pretreatment VDRL tests on the 17 completed cases and of the quarterly serologic tests for 1 year after treatment are presented in the table. One patient was serologically negative prior to treatment; the blood of another was weakly reactive. Pretreatment serologic titers ranged from 0 to 64. At the end of the first quarter five patients had become seronegative; an additional two were weakly reactive. After 6 months five were still seronegative while the serums of four were weakly reactive. At the ninth month six had lost measurable reagin; four others were weakly reactive. At the end of 1 year nine patients were seronegative, and one was weakly reactive. In addition, five patients showed a fourfold or more decrease in titer; another, less than a fourfold decrease; and one patient exhibited no change from his original titer. It was expected that of the nine patients who became seronegative, seven were syphilitics in the primary stage.

Of the five patients who lapsed from treatment two had seronegative primary syphilis and had remained seronegative for 5 months and 8 months, respectively, at the time of their last visit. One of the remaining three patients had lost measurable reagin 2 months after treatment, another showed a fourfold decrease in titer after the same period, and the third a fivefold decrease in titer at the end of 3 months.

Spinal fluid examination was performed on all 17 patients who completed treatment. All showed normal cell count, total protein, and nonreactive spinal fluid serology.

Summary and Conclusion

Twenty-nine dark-field positive primary and secondary syphilis patients were treated with a total dose of 10 gm. of propionyl erythromycin orally over an 8-day period. Serologic ex-

aminations were performed each month for 6 months after completion of treatment and at the end of the 9th and 12th months. The genitalia, skin, mucosa, and anus were inspected each time a blood specimen was taken. Half of the patients tolerated the medication well. Drug intolerance, when present, was referable to the gastrointestinal tract. *Treponema pallidum* usually disappeared from lesions 3 or 4 days after treatment. Of the original 29 patients studied, 5 were recalcitrant and were lost from the project, 4 became reinfecting, and 3 were treatment failures. The failure rate was 3 in 20 cases, or 15 percent. Seventeen patients completed the 1 year study. Nine of these became seronegative and the serum of another, weakly reactive.

It is concluded that propionyl erythromycin shows significant promise as an antisyphilitic drug, but a dosage of 10 gm. does not produce a cure comparable to that obtained with the best schedules of penicillin.

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RAPID REAGIN TEST WITH UNHEATED SERUM AND NEW IMPROVED ANTIGEN SUSPENSION

Joseph Portnoy, Ph.D., Hilfred N. Bossak, B.S., Virginia H. Falcone, B.S., Ad Harris

THE rapid plasma reagin (RPR) test for syphilis (1) was developed chiefly to permit rapid and economical screening of large numbers of persons so that reactors could be given immediate specific and prophylactic treatment. Experience has indicated the value of the test for examining migratory workers (2). It has also been found useful in testing inmates at the Cook County Jail in Chicago and clinic patients in Memphis and Shelby County, Tenn. (personal communications).

During the development of the RPR test, the possibility of employing the same antigen suspension used in testing unheated plasma in a test with unheated serum was considered. It seemed likely that a test with unheated serum might have potential usefulness in a public health laboratory as a screening mechanism provided that a satisfactory level of sensitivity and specificity could be obtained.

An opportunity to evaluate the RPR suspension in a test with unheated serum was provided by the Serology Evaluation and Research Assembly study (3) conducted by the Public Health Service in cooperation with the authors of the tests. This study indicated that a test with unheated serum, designated as the USR test, had a satisfactory level of sensitivity and specificity. This technique used 0.05 ml. of

unheated serum and $\frac{1}{45}$ ml. of RPR antigen suspension on a Boerner concavity slide.

Later reports (4,5) showed that unheated serum could be tested exactly as described for unheated plasma in the RPR test, using three drops of unheated serum and one drop of antigen suspension delivered from disposable pipettes onto Boerner concavity slides.

The first study to determine the usefulness of a screening test with unheated serum in a public health laboratory was undertaken by the New York City Health Department (6). Meanwhile, other research efforts led to the development of a new improved antigen suspension which showed much greater stability than the original RPR suspension (7). Cooperative studies of the Venereal Disease Research Laboratory and various governmental agencies have indicated excellent agreement between the results of tests using unheated plasma and both old and new improved antigen suspensions.

However, the behavior of the new antigen suspension with unheated serum has received only limited study. Because of the increasing interest in rapid reagin testing in public health laboratories, it seemed appropriate to evaluate its sensitivity and specificity. In view of the many variations of technique used with unheated serum, it was of interest to make such comparisons as would permit a recommendation for a single technique.

Methods

The serums used were from known clinical categories and had been kept in the frozen state, previously unheated.

The authors are with the Venereal Disease Research Laboratory, Communicable Disease Center, Public Health Service, Atlanta, Ga. Dr. Portnoy is assistant director of the laboratory, Mr. Bossak and Mrs. Falcone are bacteriologists, and Mr. Harris is the director.

The VDRL slide test (8) results were those obtained on these serums in an earlier study. Whenever a difference in reactivity was noted among any of the tests, repeat testing with both VDRL slide and USR tests was accomplished simultaneously.

Using paraffin-ringed slides, as recommended for VDRL slide tests, comparative testing was accomplished with the following amounts of unheated serum and the new improved RPR antigen suspension:

Test A: 0.05 ml. serum and 1/60 ml. antigen suspension (delivered with 20-gauge needle)

Test B: 0.05 ml. serum and 1/45 ml. antigen suspension (delivered with 18-gauge needle)

Test C: 0.06 ml. serum and 1/50 ml. antigen suspension (delivered with 19-gauge needle)

These tests were carried out simultaneously.

Results and Discussion

The reactions obtained with the three variations of the USR test in comparison with results of the VDRL slide test are presented in table 1. The total number of reactive plus

weakly reactive results was the same with methods A, B, and C. However, test B, employing 0.05 ml. of serum and 1/45 ml. of antigen suspension, gave the greatest number of reactive (not weakly reactive) results and would for this reason be more advantageous than the other two methods. A slightly lower reactivity level was observed with all three unheated serum tests as compared with reactivity of the VDRL slide test in the present study. On the other hand, the SERA study (3) indicated that the USR test was consistently more reactive than the VDRL slide test. It is probable that this difference between results of the two studies is related partially to the type of slide used in performing the tests and to the different methods of preparing RPR antigen suspensions. In the SERA study, a Boerner slide was used, whereas, in this study, a flat paraffin-ringed slide was employed. A small number of tests conducted simultaneously have indicated that more reactive findings are encountered with the Boerner slide.

In the New York City study 100,000 blood specimens were tested from a random population group. Essentially similar degrees of

Table 1. Reactions obtained with unheated serum tests and VDRL slide test, according to clinical category

Clinical category	Number of specimens	Test											
		A ¹			B ²			C ³			VDRL slide		
		R	WR	N	R	WR	N	R	WR	N	R	WR	N
Primary:													
Untreated.....	48	24	1	23	24	1	23	24	2	22	25	4	19
Treated.....	25	0	0	25	0	0	25	0	0	25	0	0	25
Secondary, untreated.....	25	22	2	1	23	1	1	21	3	1	25	0	0
Latent:													
Untreated.....	6	5	1	0	6	0	0	5	1	0	6	0	0
Treated.....	19	9	0	10	9	0	10	9	0	10	9	2	8
Late, treated.....	72	52	6	14	56	2	14	50	7	15	54	6	12
Presumed nonsyphilitic.....	225	0	0	225	0	0	225	0	0	225	0	0	225
Diseases other than syphilis.....	25	1	0	24	1	0	24	1	0	24	2	0	23
Biologic false positive:													
With nonreactive TPI.....	25	2	3	20	2	3	20	3	2	20	4	2	19
No previous TPI.....	22	4	2	16	4	2	16	3	3	16	6	2	14
Total.....	492	119	15	358	125	9	358	116	18	358	131	16	345

¹ Test A: 0.05 ml. serum and 1/60 ml. antigen suspension.

² Test B: 0.05 ml. serum and 1/45 ml. antigen suspension.

³ Test C: 0.06 ml. serum and 1/50 ml. antigen suspension.

NOTE: R—reactive; WR—weakly reactive; N—negative.

Table 2. Agreement between VDRL slide test and unheated serum tests

VDRL slide test	Number of specimens	Unheated serum tests								
		A ¹			B ²			C ³		
		R	WR	N	R	WR	N	R	WR	N
Reactive.....	131	114	8	9	120	2	9	112	9	10
Weakly reactive.....	16	5	7	4	5	7	4	4	9	3
Nonreactive.....	345	0	0	345	0	0	345	0	0	345
Percent agreement ⁴ with VDRL slide test.....		97.4			97.4			97.4		

¹ Test A: 0.05 ml. serum and 1/60 ml. antigen suspension.

² Test B: 0.05 ml. serum and 1/45 ml. antigen suspension.

³ Test C: 0.06 ml. serum and 1/50 ml. antigen suspension.

⁴ Complete and partial.

NOTE: R—reactive; WR—weakly reactive; N—negative.

reactivity were obtained with unheated serum, using 0.06 ml. of serum and 0.02 ml. of antigen suspension on a paraffin-ringed slide, and the VDRL slide test. Satisfactory results with this procedure were reported by Widelock and co-workers (6).

In table 2, the agreement between the VDRL slide test and the unheated serum test is presented. The same high percentage of agreement was noted for all three tests.

On the basis of the findings obtained in this study, it appears advisable to recommend, in the interest of uniformity, the technique using 0.05 ml. of serum and 1/45 ml. of new improved antigen suspension on a 14 mm. paraffin-ringed slide for the performance of the unheated serum reagin test. This represents the same proportion of serum and antigen previously employed in the SERA study.

Summary and Conclusions

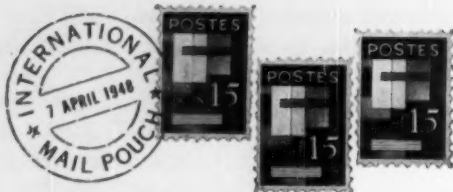
Three methods of performing the unheated serum reagin test were compared, and no significant difference in reactivity between these methods was observed.

It is recommended, in the interest of uniformity, that the unheated serum reagin test be performed on a 14 mm. paraffin-ringed slide

using 0.05 ml. of serum and 1/45 ml. of new improved antigen suspension.

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Health Week in Ghana

Improved nutrition was emphasized during National Health Week, October 23-29, 1960, in Ghana. Pregnant women, infants, and weanlings received special attention. Schools, religious organizations, radio stations, and newspapers combined to help publicize the week's theme, "Good Food for Good Health."

—JEAN M. PINDER, *health education adviser, U.S. Operations Mission, Ghana.*

New Medical School

The Medical School of the University of Costa Rica began its first class in March 1961. The basic medical science courses will be taught in a new building on the university campus. Clinical study will be conducted chiefly at the San Juan de Dios Hospital in San José.

The Health and Sanitation Division of the U.S. Operations Mission assisted the school during the years of planning. The ICA has a contract with Louisiana State University whereby faculty members of the L.S.U. Medical School will be assigned to work for varying periods with Costa Rican educators who are being trained in the latest teaching methods and laboratory techniques.

—DR. ANTHONY DONOVAN, *chief, health and sanitation division, U.S. Operations Mission, Costa Rica.*

Eradication Preparation

To control the malaria epidemic and prepare for an eradication campaign, a control project was initiated in Haiti in November 1960. Reduction of malaria incidence is the primary object of the project, but the collection of data and the organization of an administrative unit will lay the groundwork for an eradication campaign which was suspended in 1958 and will be resumed in 1961.

The project, proposed by the Minister of Health, is being carried out by the Haitian American Development Organization in cooperation with the

Servicio Cooperativo Inter-americano de Salud Pública.

Local staffs of the Ministry's hospitals, health centers, and rural dispensaries administer antimalarial drugs and take blood specimens from each person treated. The specimens are analyzed, and the results are tabulated.

—EDWARD E. MINTY, *acting chief, public health division, U.S. Operations Mission, Haiti.*

Milestone

Brazil's first director of the Division of Occupational Health of the SESP-Foundation (Fundação Serviço Especial de Saúde Pública) is Engineer Pedro Monteiro Gondim, appointed December 1, 1960.

SESP began occupational health activities in 1949 by conducting a survey to determine the health status of Brazilian workers and by sponsoring a 3-month course in industrial hygiene for physicians, engineers, and other public health workers. Since that time, the training of personnel has remained a major activity. Over a period of 11 years the occupational health project has provided a total of 13 training grants.

—DR. VERNON J. FORNEY, *chief, public health division, U.S. Operations Mission, Brazil.*

Diet Deficiencies

The high death rate among Guatemalan children is attributed to inadequate diet, chiefly in protein-containing foods, by Dr. Nevin S. Scrimshaw, quoted in the *Washington Star*. Dr. Scrimshaw, director of the Institute of Nutrition of Central America and Panama, said that investigations in four Guatemalan villages revealed that 40 percent of the deaths of children 1 to 4 years old were caused by kwashiorkor, a nutritional disease. Of the remainder, nearly all were caused by complications of common childhood infections not normally fatal to well-nourished children.

Dr. Scrimshaw also stressed that there is increasing evidence that deficiencies which retard physical growth are associated in some way with retardation of intellectual development. He said that in Mexico a direct correlation had been found between intelligence test scores and weight deficiencies due to poor diets.

Undergraduate Colleges of Physicians

Colleges and universities in the United States vary widely in the proportion of their graduates who became physicians. This monograph discusses the differences in rates of production of such graduates associated with certain characteristics of the undergraduate institutions. The study is concerned with the baccalaureate origins of physicians who were graduated from medical schools in the United States in 1950-59.

There were 389 undergraduate colleges which had 25 or more graduates who obtained M.D. degrees in 1950-59. These colleges accounted for 93 percent of all recipients of M.D. degrees from medical schools in the United States in the 10-year period.

The main part of the report investigates the relationship between the percent of male graduates of 358 liberal arts, coeducational and men's colleges who became physicians (the male M.D. index) and such characteristics of the colleges as type of administrative control (Protestant, Catholic, nondenominational, or public), presence of one or more professional schools, amount of tuition, geographic location, and production of graduates who obtained other advanced degrees. Other parts of the report deal with nine women's colleges, nine predominantly Negro colleges, and the colleges

which produced the greatest absolute numbers of graduates with M.D. degrees.

The male M.D. index for all 358 liberal arts colleges was 4.9 percent. Colleges under Protestant auspices had an average index of 6.2 percent while those under public control, 3.2 percent. Colleges with tuition for the academic year 1950-51 of \$500 or more had a male M.D. index of 6.1 percent; those with tuition under \$500, 4.5 percent. Universities with an affiliated medical school had an index of 5.7 compared with 4.7 for those colleges without an affiliated medical school.

Colleges in the south had the highest average male M.D. index, followed by those in the west, the northeast, and the north central regions. The colleges with the highest male M.D. index tended to have high production rates for scholars and for science doctorates.

The average M.D. index for the nine women's colleges with 25 or more M.D. graduates was 2.1 percent, but the range was from 0.8 to 2.9 percent. The nine predominantly Negro colleges in the study had an average male M.D. index of 7.0 percent.

Harvard University produced the largest number of graduates who became physicians in the 10-year period. This university and the

Public Health Monograph No. 66
Baccalaureate Origins of 1950-59 Medical Graduates. By William A. Manuel and Marion E. Altenderfer. Public Health Monograph No. 66 (PHS Pub. No. 845), 30 pages, illustrated. U.S. Government Printing Office, Washington, D.C., 1961, 25 cents.

The accompanying summary covers the principal contents of Public Health Monograph No. 66, published concurrently with this issue of *Public Health Reports*. Dr. Manuel is professor emeritus of chem-

istry at Ohio Wesleyan University, Delaware, Ohio, and Miss Altenderfer is a statistician in the Division of Public Health Methods, Public Health Service.

For readers wishing the data in full, copies are on sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Official agencies and others directly concerned may obtain single sample copies without charge from the Public Inquiries Branch, Office of Information, Public Health Service. Copies will be found also in the libraries of professional schools and the major universities and in selected public libraries.

University of Michigan and New York University each had well over 1,000 graduates who obtained M.D. degrees during 1950-59. Of the 50 colleges which produced the most M.D. graduates, 48 had affiliated medical schools.

The highest male M.D. index (25.3 percent) was for La Sierra College in California, and the next highest (22.5) was for Pacific Union College, also in California. Of the 10 colleges with the highest male M.D. indexes, 4 (La

Sierra, Pacific Union, Atlantic Union, and Walla Walla) are controlled by the Seventh Day Adventist Church.

The monograph includes an appendix showing the number and percent of M.D. graduates, together with the characteristics used in the analysis, for each college and university with 25 or more graduates receiving M.D. degrees in 1950-59 from medical schools in the United States.

1960 Census Data for Small Areas

Published and unpublished data for small areas that cover the entire United States are now available from the 1960 Census of Population and Housing.

Complete-count data have been tabulated for each of the 270,000 enumeration districts into which the country was divided for census purposes. The tabulations include population data on age, sex, color, marital status, and relationship, and housing data on tenure, vacancy status, color, condition and plumbing, number of rooms, persons per room, property value, and rent. These data are available only in photocopies or microfilms of listings and special tables and on magnetic tape for use on electronic computers.

Similar data for the approximately 23,000 census tracts comprising 135 standard metropolitan statistical areas and certain other areas will be published by the end of 1961 in the PHC(1) report series.

Complete-count tabulations presenting limited housing statistics by city blocks for cities with 50,000 inhabitants or more and other selected areas are being published in a series of 421 separate city reports of the 1960 Census of Housing.

Complete-count data on certain population characteristics (age, sex, race, marital status, and households) of some 30,000 minor civil divisions and other untraced areas have been published in series PC(1)A, Number of Inhabitants, and PC(1)B, General Population Characteristics. Other population

and housing data for these areas are available in unpublished tables and on tape.

Sample data on population and housing were collected from one in four households and will be published this fall and winter in series PC(1)C, General Social and Economic Characteristics. These data cover a wide range of subjects such as country of origin, schooling, occupation, income, heating equipment, water supply, sewage disposal, and automobiles available. Selected statistics were collected also on the nonwhite population, the white population with Spanish surnames in certain States, and the population of Puerto Rican birth or parentage.

Most of the sample data for census tracts will be published with the complete-count data as stated above. Sample data for minor civil divisions will be available only in unpublished tables and on tape.

Both the complete-count and sample data have been summarized for larger areas—urban places, counties, urbanized areas, standard metropolitan statistical areas, and States. Certain summary data have been published in the PC(1)A and PC(1)B population reports; the remainder will be published this fall and winter in the PC(1)C and the HC(1) housing reports.

Detailed information on availability and cost of the materials may be obtained by writing to the Chief, Population Division, or the Chief, Housing Division, or the Public Information Office, Bureau of the Census, Washington 25, D.C.

Milk Sanitation Honor Roll for 1959-61

Sixty communities have been added to the Public Health Service milk sanitation "honor roll," and 55 communities on the previous list have been dropped. This revision covers the period from July 1, 1959, to June 30, 1961, and includes a total of 273 cities and 123 counties.

Communities on the honor roll have complied substantially with the various items of sanitation contained in the milk ordinance recommended by the U.S. Public Health Service. The State milk sanitation authorities concerned report this compliance to the Service. The rating of 90 percent or more, which is necessary for inclusion on the list, is computed from the weighted average of the percentage of compliance. Separate lists are compiled for communities in which all market milk sold is pasteurized, and for those in which both raw milk and pasteurized milk are sold.

The recommended milk ordinance, on which the milk sanitation ratings are based, is now in effect through voluntary adoption in 500 counties and 1,423 municipalities. The ordinance also serves as the basis for the regulations of 36 States. In 16 States it is in effect statewide.

The ratings do not represent a complete measure of safety, but they do indicate how closely a community's milk supply conforms with the standards for grade A milk as stated in the recommended ordinance. High-grade pasteurized milk is safer than high-grade raw milk because of the added protection of pasteurization. The second list, therefore, shows the percentage of pasteurized milk sold in a community which also permits the sale of raw milk.

Although semiannual publication of the list is intended to encourage communities operating under the

This compilation is from the Milk and Food Program, Division of Environmental Engineering and Food Protection, Public Health Service. The previous listing was published in Public Health Reports, April 1961, pp. 363-366. The rating method is described in PHS Publication No. 678 (Methods of Making Sanitation Ratings of Milksheds).

recommended ordinance to attain and maintain a high level of enforcement of its provisions, no comparison is intended with communities operating under other milk ordinances. Some communities might be deserving of inclusion, but they cannot be listed because no arrangements have been made for determination of their ratings by the State milk sanitation authority concerned. In other cases, the ratings which were submitted have lapsed because they are more than 2 years old. Still other communities, some of which may have high-grade milk supplies, have indicated no desire for rating or inclusion on this list.

The rules for inclusion of a community on the honor roll are:

1. All ratings must be determined by the State milk sanitation authority in accordance with the Public Health Service rating method, which is based upon the grade A pasteurized milk and the grade A raw milk requirements of the Public Health Service recommended milk ordinance.

2. No community will be included on the list unless both its pasteurized milk and its retail raw milk

ratings are 90 percent or more. Communities in which only raw milk is sold will be included if the retail raw milk rating is 90 percent or more.

3. The rating used will be the latest submitted to the Public Health Service, but no rating will be used which is more than 2 years old. (In order to promote continuous rigid enforcement rather than occasional "cleanup campaigns," it is suggested that, when the rating of a community on the list falls below 90 percent, no resurvey be made for at least 6 months. This will result in the removal of this community from the subsequent semiannual list.)

4. No community will be included on the list whose milk supply is not under an established program of official routine inspection and laboratory control provided by itself, the county, a milk-control district, or the State. (In the absence of such an official program, there can be no assurance that only milk from sources rating 90 percent or more will be used continuously.)

5. The Public Health Service will make occasional check surveys of cities for which ratings of 90 percent or more have been reported by the State. (If the check rating is less than 90 percent, but not less than 85, the city will be removed from the 90-percent list after 6 months unless a resurvey submitted by the State during this probationary period shows a rating of 90 percent or more. If the check rating is less than 85 percent, the city will be removed from the list immediately. If the check rating is 90 percent or more, the city will be retained on the list for 2 years from the date of the check survey, unless a subsequent rating during this period warrants its removal.)

**Communities awarded milk sanitation ratings of 90 percent or more and date of rating during
1959-61**

100 PERCENT OF MARKET MILK PASTEURIZED

<i>Arkansas</i>	<i>Idaho—Continued</i>	<i>Iowa—Continued</i>	<i>Kentucky—Continued</i>
Fort Smith..... 8- 7-59	Lewiston..... 12-12-60	Pocahontas..... 10-20-59	Paducah-Mc-
<i>Colorado</i>	Pocatello..... 2-13-61	Rockwell City..... 10-21-59	Cracken co..... 11-30-60
Boulder co..... 5- -60	Rigby..... 4- 6-60	Sanborn..... 1-25-61	Pendleton co..... 8-10-60
Colorado	<i>Illinois</i>	Sioux City..... 4-29-60	Princeton..... 7-20-60
Springs..... 10- -60	Elgin..... 12-20-60	Spencer..... 2-26-60	Russellville..... 5- 1-61
Denver and	North Shore	Storm Lake..... 10-14-59	Shelbyville-
Denver co..... 2- -61	municipalities	Washington..... 7- 1-60	Shelby co..... 6-15-60
<i>LAS Animas-</i>	(Glencoe,	Waterloo..... 11-20-59	Smithland-
Huerfano cos..... 1- -60	Kenilworth,	Webster City..... 10-19-59	Livingston co..... 3- 1-60
Northeast Dis-	Lake Bluff,	<i>Kentucky</i>	Taylorsville-
trict (Logan,	Lake Forest,	Ashland-Boyd co..... 2-16-61	Spencer co..... 6-16-60
Morgan,	Northfield,	Bell co..... 8- 4-59	Webster co..... 6-20-60
Phillips,	Wilmette,	Benton..... 3- 2-60	<i>Mississippi</i>
Sedgwick,	Winnetka)..... 6-21-60	Bowling Green-	Biloxi..... 10- 8-59
Yuma cos)..... 1- -61	<i>Indiana</i>	Warren co..... 11-16-60	Booneville..... 10-12-60
Pueblo co..... 8-13-59	Evansville..... 5-26-60	Campbellsville..... 1- 2-61	Brookhaven..... 1-26-60
Weld co..... 1-26-61	<i>Iowa</i>	Covington..... 3- 1-61	Canton..... 6- 9-60
<i>District of Columbia</i>	Ames..... 3-15-60	Cynthiana-Har-	Cleveland..... 7-14-60
Washington..... 12-11-59	Anamosa..... 12- 9-59	rison co..... 8- 9-60	Columbia..... 5-25-60
<i>Georgia</i>	Atlantic..... 10- 7-59	Danville-Boyle	Columbus..... 5- 4-60
Albany..... 8- 5-60	Boone..... 3- 4-60	co..... 2-11-60	Eupora..... 9-24-59
Athens-Clarke	Burlington..... 3-17-60	Elizabethtown-	Greenville..... 7-25-60
co..... 8-11-60	Cedar Falls..... 11-25-59	Hardin co..... 11-23-59	Greenwood..... 2- 2-60
Atlanta-Fulton	Cedar Rapids..... 8-18-60	Flemingsburg-	Grenada..... 9-17-59
co..... 11- 1-60	Clarion..... 10-22-59	Fleming co..... 8- 8-60	Gulfport..... 10- 8-59
Augusta..... 2-17-61	Clear Lake..... 12- 8-60	Frankfort..... 10- 8-59	Hattiesburg..... 2-23-60
Brunswick-	Clinton..... 8-27-59	Fulton co..... 1-19-61	Iuka..... 10-13-60
Glynn co..... 12-15-60	Corydon..... 2- 2-60	Glasgow..... 12-15-60	Kosciusko..... 4-25-60
Cairo..... 3-22-60	Davenport..... 5-12-60	Georgetown-	Laurel..... 4-20-61
Calhoun-Gordon	Des Moines..... 6- 3-60	Scott co..... 10- 9-59	Lucedale..... 8-17-60
co..... 7-27-60	Dubuque..... 4- 7-60	Greenville..... 3-30-60	Meadville..... 8-23-60
Cartersville-	Dyersville..... 12- 8-59	Henderson co..... 7-10-59	Meridian..... 11-18-59
Bartow co..... 12- 1-60	Eagle Grove..... 10-19-59	Hodgenville..... 9- 6-60	Monroe co..... 5- 3-61
Chatham co..... 9-23-60	Estherville..... 6-10-60	Hopkinsville-	Morton..... 5-11-61
Columbus..... 10-14-60	Fort Dodge..... 5-10-61	Christian co..... 4-21-60	New Albany..... 8-27-59
Dalton..... 2- 5-60	Grinnell..... 6- 1-61	Louisville-Jef-	Oxford..... 5- 2-61
Fitzgerald..... 12-16-60	Humboldt..... 10-20-59	erson co..... 12-11-59	Pascagoula..... 8-18-60
Macon..... 4-14-61	Ida Grove..... 4-22-60	Lyon co..... 3- 1-60	Picayune..... 4-18-61
Quitman..... 6- 9-61	Iowa City..... 8-25-60	Mayfield..... 12- 2-60	Starkville..... 1- 9-61
Thomasville..... 3-18-60	Lake View..... 4-20-60	Maysville-	State College..... 1- 9-61
Troup co..... 10-13-60	Le Mars..... 1-28-60	Mason co..... 12-20-60	Tupelo..... 9-20-60
Valdosta..... 2-10-61	Lytton..... 10-21-59	McLean co..... 3-28-60	West Point..... 5-18-60
Washington..... 12- 9-60	Manning..... 4-20-60	Monticello-	<i>Missouri</i>
Waycross..... 3-11-60	Maquoketa..... 12- 9-59	Wayne co..... 4-21-60	Cape Girardeau..... 8-16-60
<i>Idaho</i>	Marshalltown..... 10-21-59	Morgantown..... 11-24-59	Chillicothe..... 8-19-59
Blackfoot..... 4- 5-60	Mason City..... 1-20-60	Murray-Cal-	Hannibal..... 8-19-59
Caldwell..... 12- 8-60	Mount Pleasant..... 5-16-60	loway co..... 1- 7-60	Kansas City..... 10-27-59
Grangeville..... 12- 8-60	Ottumwa..... 10- 7-60	Newport..... 2-28-61	Rolla..... 11-29-60
	Paullina..... 7-20-60	Owensboro..... 2- 5-60	St. Joseph..... 1-27-60
		Owenton..... 8-12-60	St. Louis..... 3- 7-61

**Communities awarded milk sanitation ratings of 90 percent or more and date of rating during
1959-61—Continued**

100 PERCENT OF MARKET MILK PASTEURIZED—Continued

<i>Missouri—Continued</i>	<i>North Carolina—Continued</i>	<i>Tennessee—Continued</i>	<i>Texas—Continued</i>
St. Louis co. 7-19-60	Mecklenburg co. 10-23-59	Loudon..... 5-23-60	Tyler..... 2- 8-61
Sikeston..... 12-10-59	Montgomery co. 4- 7-60	McMinnville... 4-24-61	Wichita Falls... 10-21-60
Springfield..... 3-21-60	Moore co. 7-13-60	Manchester..... 10-12-60	
	Nash co. 10-14-59	Maryville and	<i>Utah</i>
<i>Nebraska</i>	New Hanover co. 12-10-59	Alcoa..... 3-29-60	Logan..... 6-10-60
Omaha..... 8-26-60	Northampton co. 8-16-60	Memphis..... 5- 3-60	Ogden..... 2-25-60
	Pamlico co. 8-28-59	Morristown..... 5-25-60	Salt Lake City... 5-26-60
<i>New Mexico</i>	Pasquotank co. 6- 9-60	Mount Pleasant 9-26-60	Utah co..... 3-23-60
Albuquerque..... 7-21-60	Perquimans co. 6- 9-60	Murfreesboro... 5-22-61	
Artesia..... 11- 1-60	Pitt co. 7- 7-60	Nashville-David-	<i>Virginia</i>
Carlsbad..... 11- 2-60	Randolph co. 5-11-60	son co..... 10-21-59	Alexandria..... 5-11-61
Clovis..... 8- 4-60	Richmond co. 5-12-60	Paris..... 11-21-60	Blacksburg..... 9-22-60
Farmington..... 7- 8-60	Rockingham co. 5- 3-60	Pulaski..... 8- 3-59	Christiansburg... 9-22-60
Portales..... 10-29-60	Rocky Mount... 10-14-59	Rogersville..... 4-26-60	Colonial Heights.. 4-14-61
	Rowan co. 2-20-61	Sevier co..... 1- 5-61	Hampton..... 4-20-61
<i>North Carolina</i>	Sampson co..... 11- 1-60	Sparta..... 7-14-60	Newport News... 5-10-61
Alamance co. 9-16-60	Scotland co. 6-23-60	Sullivan co.....	Norfolk..... 6- 3-60
Alexander co. 11-29-60	Stokes co. 5-24-60	(Bristol and	Petersburg..... 11- 7-60
Alleghany co. 6-28-60	Swain co. 4-19-61	Kingsport).... 4-18-61	Portsmouth..... 2-24-61
Anson co. 8-31-60	Tyrrell co. 2-18-60	Tullahoma..... 10-10-60	Radford..... 9-22-60
Ashe co. 6-28-60	Union co. 8- 3-60	Waverly..... 8-22-60	Richmond..... 4-25-60
Bertie co. 6- 9-60	Wake co. 5- 3-61		Roanoke..... 7- 8-60
Brunswick co. 1- 3-61	Warren co. 10-13-60	<i>Texas</i>	Staunton..... 3- 8-60
Burke co. 9-27-60	Washington co. 2-18-60	Amarillo..... 5- 3-60	Waynesboro..... 4-21-60
Cabarrus co. 11- 8-60	Watauga co. 6-28-60	Beaumont..... 4- 4-61	
Camden co. 6- 9-60	Wayne co. 11- 5-59	Big Spring..... 8-21-59	<i>Washington</i>
Catawba co. 11-29-60	Wilkes co. 5-25-60	Bryan..... 7-17-59	Everett..... 10-28-59
Chowan co. 6- 9-60	Wilson co. 8-28-59	Burkburnett..... 8-11-59	Spokane..... 9-27-60
Cleveland co. 9-12-60		College Station 7-16-59	Tacoma..... 8-25-59
Craven co. 4-10-61	<i>Oklahoma</i>	Dallas..... 12-14-60	Whitman co..... 10-27-60
Cumberland co. 11-27-59	Mangum..... 11-12-59	Edinburg..... 1-25-60	
Currituck co. 6- 8-60	Oklahoma City 10-28-60	El Paso..... 9-11-59	<i>West Virginia</i>
Dare co. 6- 8-60	Oklmulgee..... 10- 4-60	Falfurrias..... 9-10-59	McDowell co... 8- 1-60
Durham co. 12-18-59	Ponca City..... 9-30-60	Galveston..... 1-24-61	Ohio co..... 11-14-59
Edgecombe co. 3-15-61		Gonzales..... 7-24-59	
Forsyth co. 6-24-60	<i>Tennessee</i>	Grand Prairie... 4-19-61	<i>Wisconsin</i>
Gates co. 7-21-60	Athens..... 9- 3-59	Greenville..... 5-15-61	Appleton..... 1- 5-61
Guilford co. 3-31-61	Cleveland..... 9- 2-59	Harlingen..... 9-10-59	Eau Claire..... 2-10-61
Halifax co. 2- 9-61	Columbia..... 9-28-60	Houston..... 6- 8-60	Intercity Control
Harnett co. 8-11-60	Cookeville..... 6-30-60	Lubbock..... 9- 2-60	Council (Bur-
Haywood co. 3-30-60	Covington..... 11-29-60	McAllen..... 1-26-60	lington, Elk-
Henderson co. 8-30-60	Fayetteville... 6-30-60	Mercedes..... 1-26-60	horn, Fort
Hertford co. 7-21-60	Greeneville... 4-27-60	Midland..... 8-21-59	Atkinson).... 12- 2-60
Iredell co. 12-11-59	Huntingdon..... 10-26-60	Mineral Wells... 7-10-59	Kaukauna..... 1- 4-61
Jackson co. 4-19-61	Jackson-Madison	Odessa..... 8-21-59	La Crosse..... 8-12-60
Lenoir co. 1-20-61	co..... 9- 1-60	Paris..... 3-10-61	Madison..... 4-10-61
Lincoln co. 11-29-60	Jamestown..... 10-17-60	San Angelo..... 9- 4-59	Neenah-
Macon co. 4-19-61	Kingston..... 8-16-60	San Antonio..... 4-12-61	Menasha..... 11-10-60
Madison co. 6-15-60	Knoxville..... 5- 2-61	San Benito..... 9-10-59	Racine..... 12-15-60
Martin co. 7- 7-60	Lewisburg..... 10-25-60	Sweetwater..... 9-25-59	Stevens Point... 2- 1-61
		Texarkana..... 4- 7-61	Wausau..... 8-26-60

**Communities awarded milk sanitation ratings of 90 percent or more and date of rating during
1959-61—Continued**

BOTH RAW AND PASTEURIZED MARKET MILK¹

<i>Arkansas</i>	<i>Kentucky</i>	<i>Oklahoma</i>	<i>Texas—Continued</i>
Little Rock (99.8)----- 10-14-59	Lexington-Fayette co. (99.7) 5-12-60	Lawton (99.5)--- 1-15-59	Palestine (99.79)----- 7-10-59
	Madisonville- Hopkins co. (99.8)----- 7-21-60	Shawnee (98.98) 1-29-60	Waco (99.97)---- 9-25-59
<i>Georgia</i>		Stillwater (99.7) 5-26-60	
Macon (99.85)--- 11- 9-59	Somerset-Pulaski co. (96)----- 6-10-60	<i>Oregon</i>	<i>Virginia</i>
Moultrie (96.8) 3-17-61		Portland (99.9)--- 9-18-59	Charlottesville (99.7)----- 10-15-59
Newnan (98.1)--- 4- 5-61		<i>Tennessee</i>	Danville (99.6)--- 10-28-60
	<i>Missouri</i>	Harriman (95)--- 8-16-60	<i>Washington</i>
<i>Idaho</i>	Joplin (98.5)---- 1-31-61		Benton- Franklin cos. (98.5)---- 10-24-60
Ada co. (95)---- 12-12-60	<i>North Carolina</i>	<i>Texas</i>	
Canyon co. (98.2)----- 12-12-60	Buncombe co. (99.1)----- 9-20-59	Abilene (99.67)--- 7- 2-59	
Nampa (99)---- 12- 8-60	Caldwell co. (97.7)----- 6- 7-60	Austin (99.9)---- 11-19-59	
	Robeson co. (98.2)----- 2-24-60	Brownsville (99.3)----- 8-27-59	<i>West Virginia</i>
<i>Iowa</i>		Denton (97.7)--- 7-30-59	Monongalia co. (98.4)----- 7-15-60
Carroll (98.5)--- 5-14-60		Hereford (97)--- 3-27-59	

¹ Figures in parentheses show the percentage of the milk pasteurized.

NOTE: In these communities the pasteurized market milk shows a 90 percent or more compliance with the grade A pasteurized milk requirements, and the raw market milk shows a 90 percent or more compliance with the grade A raw milk requirements of the milk

ordinance recommended by the U.S. Public Health Service.

Notice particularly the percentage of the milk pasteurized in the various communities listed. This percentage is an important factor to consider in estimating the safety of a city's milk supply. All milk should be pasteurized, whether commercially or at home, before it is consumed.

Federal Employees' Health Plans

Almost 6 million persons are enrolled in the two health benefits programs administered for Federal Government employees and annuitants, and dependents of these two groups, by the U.S. Civil Service Commission. This enrollment constitutes 4.5 percent of the 132 million persons in the United States having some form of health benefits protection.

About 5,397,500 persons were enrolled in the Federal Employees Health Benefits Program as of March 31, 1961. Of these, 1,779,000 were employees, 26,000 were employee and survivor annuitants who continued their health benefits coverage, and 3,592,500 were dependents of employees and annuitants.

The Retired Federal Employees Health Benefits Program had an enrollment of 236,000 employee or survivor annuitants as of July 1, 1961. More than 150,000 dependents are also covered under this program.

Federal Publications

Highlights of Research Progress in General Medical Sciences, 1960. *PHS Publication No. 815; 45 pages; 25 cents.*

A concise review of important research findings in biochemical problems, environmental health, and clinical medicine is presented. In addition, major organizational changes and programs in research grants, research training, and aging research are described.

National Institutes of Health Scientific Directory, 1960, and Annual Bibliography, 1960. *PHS Publication No. 831 (Public Health Bibliography Series No. 34); 144 pages; 45 cents.*

This publication, intended for reference use by research workers in the biomedical sciences inside and outside Federal Government, presents the broad outlines of NIH structure, names professional staff, and lists more than 1,600 scientific and technical papers from laboratory and clinical research during 1960.

Included also are two indexes, a listing of staff members and authors, and a subject index, reflecting the scope of NIH research and providing quick reference to research areas.

Cancer Motion Picture Guide. *PHS Publication No. 848; 1961; 162 pages; \$1.*

Approximately 1,100 domestic and foreign cancer films and filmstrips for professional and nonprofessional audiences are listed alphabetically by title under appropriate subject categories. All foreign film titles have been translated, and all titles are followed by a brief abstract of contents.

Research Programs in Aging. *PHS Publication No. 836; 1961; 24 pages; 15 cents.*

Prepared as background material for submission at congressional hearings on appropriations, this report covers, in narrative form, all intramural and extramural studies in

gerontology supported or conducted by the National Institutes of Health during 1960.

Comparative statistical summaries are given showing the number and cost of grants for a 4-year period. A bibliography lists papers on aging by staff members of NIH, Duke University, and Albert Einstein College of Medicine.

Progress Against Cancer, 1960. *PHS Publication No. 812; 1961; 57 pages.*

Brief summaries of research findings reported by staff scientists and grantees of the National Cancer Institute deal with viruses, environmental cancer, diagnosis, chemical and other therapy, survival rates, leukemia, cancer cells, and tumors in animals. Prepared for presentation at congressional hearings on appropriations, the report also contains the full text of the opening statement by the director of the institute.

Private Support for Mental Health: A study of the support, by foundations and other private national granting agencies, for mental health and related disciplines. *PHS Publication No. 838; by Jeanne L. Brand; 1961; 45 pages; 35 cents.*

Fields of research supported, types of support awarded, comparative amounts of support, and policies of the agencies concerned are discussed. An annotated appendix lists 142 agencies which have support available for mental health.

The publication is designed for the use of private and governmental granting agencies, as well as individuals interested in funds for mental health programs from nongovernmental sources.

Research Highlights in Aging, 1960. *PHS Publication No. 854; 1961; 50 pages; 25 cents.*

Selected papers on research in aging supported or carried out by the National Institutes of Health are reviewed. The research ranges

from fundamental studies in the biology of aging to studies concerned with physical, psychological, and social problems.

Reviews of new literature, important meetings, programs of five major multidisciplinary centers for aging research, and training programs are included.

Pollution-Caused Fish Kills in 1960. *PHS Publication No. 847; 1961; 20 pages.*

The estimated number of fish killed by pollution in lakes, streams, and rivers is tabulated by State. Locations of kills, sources of pollution, and extent of damage are also given. The narrative section of the report covers reporting methods and quotes from State reporting agencies on causes of kills and suggested remedies.

Activities of the National Institutes of Health in the Field of Gerontology, January 1961. *PHS Publication No. 841; 46 pages; 35 cents.*

Grants for all research in aging active on January 31, 1961, are arranged in two categories, those primarily and those secondarily related to aging. In each category the grants are classified as general, major multidisciplinary research, structural aspects of aging, physiological and biochemical aspects, psychological aspects, social aspects, identifiable disease processes, and training.

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